Plant Physiol. (1988) 86, 000–000
0032-0889/88/86/0/00/$01.00/0

Author Index

A

Abrahamsen, Mitchell, 584
Adams III, William W., 117
Brunswick, Pamela, 378
Akazawa, Takashi, 137
Al-Abed, Souhail R., 773, 987
Albert, Fred, 547
Allen, Randy D., 527
Alosi, M. Carol, 1089
Anderson, Anne J., 547
Andrews, John, 533
Aoyagi, Kazuko, 364
Apel, Klaus, 706
Atkins, Craig A., 204
Avron, Mordhay, 1286
Azcon-Bieto, Joaquin, 1199

B

Baas, Robert, 914
Bandurski, Robert S., 79, 868
Barabás, Klára, 335
Barlow, Edward W., 1108
Barr, Rita, 1264
Batschauer, Alfred, 706
Bauer, Wolfgang D., 1210, 1228
Beachy, Roger N., 1281
Beale, Samuel I., 497
Beehl, Böle, 711
Bell, John N., 182
Ben-Amotz, Ami, 1286
Bennett, Alan B., 1057
Benziman, Moshe, 1099, 1104
Bergman, Birgitta, 112
Berkowitz, Gerald A., 329
Bernal-Lugo, Irma, 643
Bernier, Georges, 1095
Bethlenfalvay, Gabor J., 1292
Betz, Augustin, 457
Bhuvaneswari, T. V., 1210
Binzel, Marla L., 607
Birch, Douglas G., 688
Birecka, Helena, 224
Birecki, Mieczyslaw, 224
Bitonti, Alan J., 224
Blevins, Dale G., 1084
Bliss, Fredrick A., 399
Block, Maryse A., 1179
Blowers, David P., 505
Blumenfeld, Amos, 13
Bögemann, Gerard, 971
Böger, Peter, 769
Bogorad, Lawrence, 1020
Bohnert, Hans J., 1002
Boller, Thomas, 182
Bose, Salil, 946
Boss, Wendy F., 505
Böttger, Michael, 1038, 1044
Boudet, Alain M., 631
Boveris, Alberto, 626
Boyer, Charles D., 786
Boyer, John S., 725, 1163
Bradford, Kent J., 406
Brangeon, Judy, 990
Breaux, E. Jay, 359
Breidenbach, R. William, 993
Brenner, Mark L., 71
Bressan, Ray A., 607
Briggs, Winslow R., 299, 306, 435, 706
Brightman, Andrew, 631
Brightman, Andrew O., 1264
Brock, Thomas G., 1155
Broekaert, Willem F., 569, 598
Brooks, Carolyn Anne, 826
Broughton, Heather L., 740
Brown, Milford S., 1292
Brown, R. Harold, 667
Brown, Tracy, 987
Brummett, Donald L., 28
Brun, William A., 71
Brunswick, Pamela, 378, 384
Burnell, James N., 1252
Burow, Mark, 399
Byerrum, Richard U., 98

C

Caetano-Anolliés, Gustavo, 1228
Caffrey, Martin, 754
Callaghan, Theresa, 1099, 1104
Campbell, Douglas, 447
Canet, Daniel, 935
Cannon, Susan, 44, 50
Canut, Hervé, 631
Canvin, David T., 655, 677
Caspar, Timothy, 1131
Cataldo, Dominic A., 734
Chaudhari, Panna, 44
Chen, Kai-Hsien, 822
Chen, Yuguang, 941
Chen, Zhixiang, 987
Cheniae, George M., 1136, 1143
Ching, Te May, 941
Chisnell, John R., 79
Chrestin, Hervé, 899
Chua, Nam-Hai, 364
Cline, Kenneth, 1120
Cline, Steven D., 161
Cohen, Eric J., 224
Cohen, Jerry D., 522, 822
Collins, Cynthia, 390
Conn, Eric E., 895
Connan, A., 967
Conrad, Patricia A., 684
Conroy, Jann P., 1108
Coscia, Carmine J., 161
Cosgrove, Daniel J., 469
Cottrell, Matthew, 652
Cowan, Ian R., 1032
Crane, Frederick L., 1264
Cresswell, Christopher E., 378
Cresswell, Christopher F., 384
Criddle, Richard S., 166
Croxdale, Judith, 16
Cséke, Csaba, 10
Cunningham, Francis X., Jr., 996
Czarnecka, Eva, 1048

D

Daie, Jaleh, 575
Damerval, Catherine, 1304
Darmency, H., 967
Datko, Anne H., 369
D'Auzac, Jean, 899
Davies, Peter J., 338, 951, 956, 978
Davis, Jeanine M., 129
Day, David A., 1199
De Greef, J., 836
DellaPenna, Dean, 1057
De Luca, Vincenzo, 447
De Micheli, Ana T., 1228
De Proft, M., 836
de Vienne, Dominique, 1304
De Wildt, Piet, 216
Dhindsa, Rajinder S., 1005
Dhugga, Kanwarpal S., 759
Dibble, Andrew R. G., 338
Doehlert, Douglas C., 1013
Douds, David D., 491
Drew, Malcolm C., 61
Dron, M., 967
Dry, Ian B., 1199
Dube, Phillip, 1281
Dugger, W. M., 1270
DuPont, Frances M., 231, 717
Dutton, Ron G., 355

E

Echeverria, Edgardo, 786
Edelman, Leonard, 1048
Edwards, Gerald E., 533, 1193
Elrifi, Ivor R., 688
Elstner, Erich F., 1310
Emerich, David W., 693
Ensminger, Peter A., 475
Esashi, Yohji, 39
Espie, George S., 655, 677
Esquerre-Tugaye, Marie-Thérèse, 540
Evans, Michael L., 885, 890
Evert, Ray F., 841

F

Farquhar, Graham D., 32, 1032
Favelukes, Gabriel, 1228
Fawley, Marvin W., 76
Felker, Frederick C., 1013
Fellman, John K., 129
Felts, Judy M., 983
Fernandez, Donna E., 270
Fernandez, Jesus Alvarez, 447
Filner, Phillip, 817
Fock, Heinrich P., 246
Fondren, W. Mark, 885
Fonseca, Victoria, 754
Forchioni, A., 990
Ford, Duane Merlin, 108
Fork, David C., 946
Fraley, Robert T., 359
Fraley, R. T., 602
Fujioka, Shozo, 857
Furner, Ian J., 584

G

Galili, Gad, 1281
Gamow, R. Igor, 394
Gantt, Elisabeth, 996
Garbarino, Joan, 231
García-Maya, Mitla, 643
Garden, Gwenn, 1099
Garland, Thomas R., 734
Gaskin, Paul, 857
Gasquez, J., 967
Gaudreault, Pierre-Richard, 288
Gee, Robert W., 98
Gerats, Anton G. M., 390
Gerber, Dennis W., 98
Gerth, Wayne A., 19
Gidrol, Xavier, 899
Giovanelli, John, 369

Plant Physiol. (1988) 86, 000–000
0032-0889/88/86/0/00/$01.00/0

Author Index

A

Abrahamsen, Mitchell, 584
Adams III, William W., 117
Brunswick, Pamela, 378
Akazawa, Takashi, 137
Al-Abed, Souhail R., 773, 987
Albert, Fred, 547
Allen, Randy D., 527
Alosi, M. Carol, 1089
Anderson, Anne J., 547
Andrews, John, 533
Aoyagi, Kazuko, 364
Apel, Klaus, 706
Atkins, Craig A., 204
Avron, Mordhay, 1286
Azcon-Bieto, Joaquin, 1199

B

Baas, Robert, 914
Bandurski, Robert S., 79, 868
Barabás, Klára, 335
Barlow, Edward W., 1108
Barr, Rita, 1264
Batschauer, Alfred, 706
Bauer, Wolfgang D., 1210, 1228
Beachy, Roger N., 1281
Beale, Samuel I., 497
Beehl, Böle, 711
Bell, John N., 182
Ben-Amotz, Ami, 1286
Bennett, Alan B., 1057
Benziman, Moshe, 1099, 1104
Bergman, Birgitta, 112
Berkowitz, Gerald A., 329
Bernal-Lugo, Irma, 643
Bernier, Georges, 1095
Bethlenfalvay, Gabor J., 1292
Betz, Augustin, 457
Bhuvaneswari, T. V., 1210
Binzel, Marla L., 607
Birch, Douglas G., 688
Birecka, Helena, 224
Birecki, Mieczyslaw, 224
Bitonti, Alan J., 224
Blevins, Dale G., 1084
Bliss, Fredrick A., 399
Block, Maryse A., 1179
Blowers, David P., 505
Blumenfeld, Amos, 13
Bögemann, Gerard, 971
Böger, Peter, 769
Bogorad, Lawrence, 1020
Bohnert, Hans J., 1002
Boller, Thomas, 182
Bose, Salil, 946
Boss, Wendy F., 505
Böttger, Michael, 1038, 1044
Boudet, Alain M., 631
Boveris, Alberto, 626
Boyer, Charles D., 786
Boyer, John S., 725, 1163
Bradford, Kent J., 406
Brangeon, Judy, 990
Breaux, E. Jay, 359
Breidenbach, R. William, 993
Brenner, Mark L., 71
Bressan, Ray A., 607
Briggs, Winslow R., 299, 306, 435, 706
Brightman, Andrew, 631
Brightman, Andrew O., 1264
Brock, Thomas G., 1155
Broekaert, Willem F., 569, 598
Brooks, Carolyn Anne, 826
Broughton, Heather L., 740
Brown, Milford S., 1292
Brown, R. Harold, 667
Brown, Tracy, 987
Brummett, Donald L., 28
Brun, William A., 71
Brunswick, Pamela, 378, 384
Burnell, James N., 1252
Burow, Mark, 399
Byerrum, Richard U., 98

C

Caetano-Anolliés, Gustavo, 1228
Caffrey, Martin, 754
Callaghan, Theresa, 1099, 1104
Campbell, Douglas, 447
Canet, Daniel, 935
Cannon, Susan, 44, 50
Canut, Hervé, 631
Canvin, David T., 655, 677
Caspar, Timothy, 1131
Cataldo, Dominic A., 734
Chaudhari, Panna, 44
Chen, Kai-Hsien, 822
Chen, Yuguang, 941
Chen, Zhixiang, 987
Cheniae, George M., 1136, 1143
Ching, Te May, 941
Chisnell, John R., 79
Chrestin, Hervé, 899
Chua, Nam-Hai, 364
Cline, Kenneth, 1120
Cline, Steven D., 161
Cohen, Eric J., 224
Cohen, Jerry D., 522, 822
Collins, Cynthia, 390
Conn, Eric E., 895
Connan, A., 967
Conrad, Patricia A., 684
Conroy, Jann P., 1108
Coscia, Carmine J., 161
Cosgrove, Daniel J., 469
Cottrell, Matthew, 652
Cowan, Ian R., 1032
Crane, Frederick L., 1264
Cresswell, Christopher E., 378
Cresswell, Christopher F., 384
Criddle, Richard S., 166
Croxdale, Judith, 16
Cséke, Csaba, 10
Cunningham, Francis X., Jr., 996
Czarnecka, Eva, 1048

D

Daie, Jaleh, 575
Damerval, Catherine, 1304
Darmency, H., 967
Datko, Anne H., 369
D'Auzac, Jean, 899
Davies, Peter J., 338, 951, 956, 978
Davis, Jeanine M., 129
Day, David A., 1199
De Greef, J., 836
DellaPenna, Dean, 1057
De Luca, Vincenzo, 447
De Micheli, Ana T., 1228
De Proft, M., 836
de Vienne, Dominique, 1304
De Wildt, Piet, 216
Dhindsa, Rajinder S., 1005
Dhugga, Kanwarpal S., 759
Dibble, Andrew R. G., 338
Doehlert, Douglas C., 1013
Douds, David D., 491
Drew, Malcolm C., 61
Dron, M., 967
Dry, Ian B., 1199
Dube, Phillip, 1281
Dugger, W. M., 1270
DuPont, Frances M., 231, 717
Dutton, Ron G., 355

E

Echeverria, Edgardo, 786
Edelman, Leonard, 1048
Edwards, Gerald E., 533, 1193
Elrifi, Ivor R., 688
Elstner, Erich F., 1310
Emerich, David W., 693
Ensminger, Peter A., 475
Esashi, Yohji, 39
Espie, George S., 655, 677
Esquerre-Tugaye, Marie-Thérèse, 540
Evans, Michael L., 885, 890
Evert, Ray F., 841

F

Farquhar, Graham D., 32, 1032
Favelukes, Gabriel, 1228
Fawley, Marvin W., 76
Felker, Frederick C., 1013
Fellman, John K., 129
Felts, Judy M., 983
Fernandez, Donna E., 270
Fernandez, Jesus Alvarez, 447
Filner, Phillip, 817
Fock, Heinrich P., 246
Fondren, W. Mark, 885
Fonseca, Victoria, 754
Forchioni, A., 990
Ford, Duane Merlin, 108
Fork, David C., 946
Fraley, Robert T., 359
Fraley, R. T., 602
Fujioka, Shozo, 857
Furner, Ian J., 584

G

Galili, Gad, 1281
Gamow, R. Igor, 394
Gantt, Elisabeth, 996
Garbarino, Joan, 231
García-Maya, Mitla, 643
Garden, Gwenn, 1099
Garland, Thomas R., 734
Gaskin, Paul, 857
Gasquez, J., 967
Gaudreault, Pierre-Richard, 288
Gee, Robert W., 98
Gerats, Anton G. M., 390
Gerber, Dennis W., 98
Gerth, Wayne A., 19
Gidrol, Xavier, 899
Giovanelli, John, 369

Giuliano, Giovanni, 7
Glendening, Thomas M., 319
Goldsbrough, Peter B., 1281
Gombos, Zoltán, 335
Gordon, Milton P., 584
Gotow, Kiyoshi, 700
Goudey, J. Stephen, 510
Grodzinski, Bernard, 355
Grossman, Arthur R., 1179
Grover, Paul B., Jr., 638
Grover, Scott D., 104
Guilford, William J., 134
Guinn, Gene, 28
Gunderson, Carla A., 85
Gusta, Lawrence V., 344
Guy, Micha, 817

H

Hager, Achim, 1168
Hällbom, Lars, 112
Hamabata, Alberto, 643
Hamilton, Douglas A., 951, 956
Hammer, Ulrike, 457
Hammond, John B. W., 645
Hankins, Charles N., 67, 1027
Hannapel, David J., 1174
Hanson, Andrew D., 54
Harrison, Paul J., 192
Hartung, Wolfram, 908
Hasegawa, Paul M., 607
Hasenstein, Karl Heinz, 885, 890
Hashimoto, Yohichi, 155
Hatch, Marshall D., 1252
Hauptmann, R. M., 602
Haworth, Phil, 672
Hayford, Maria B., 1216
Heckman, J. W., Jr., 848
Hedrick, Susan A., 182
Heemskerk, Johan W. M., 971
Helsper, Johannes P. F. G., 971
Hendrix, Donald L., 908
Hepler, Peter K., 684
Herbert, Stephen K., 946
Herman, Eliot M., 1027
Hess, F. Dan, 672
Hess, F. Dana, 607
Hetherington, P. Richard, 740
Heuser, Charles W., 1236
Hiatt, Andrew, 441
Higby, Mary A., 885
Higley, Michael, 562
Hilgendorf, Frank, 1038
Hilhorst, Henk W. M., 591
Hoekstra, Folkert A., 4
Hoff, Ann M., 652
Hoffman, Nancy L., 1216
Holtum, Joseph A. M., 423
Homan, Wieger L., 216
Horsch, Robert B., 602
Horwitz, Benjamin A., 299
Housley, Thomas L., 1247
Houtz, Robert L., 1136, 1143
Howitz, Konrad T., 999
Hsu, Francis C., 811
Huang, Anthony H. C., 270
Hubbs, Alan, 50
Huether, Michael J., 773
Huffaker, Ray C., 166
Hurkman, William J., 717

I

Ikuma, Hiroshi, 475
Imoto, Setsuko, 176
Inouhe, Masahiro, 1223
Ishikawa, Masaya, 344
Ishizawa, Kimiharu, 39
Isuzugawa, Kanji, 39

J

Jackson, William A., 778
Jenkins, Colin L. D., 533
Jenkins, Joane, 104
Jennings, Ian R., 1257
Jensen, Richard G., 615
Jiao, Jirong, 355
Johnson, Charles R., 491
Jones, Russell L., 960
Joó, Ferenc, 335
Joyce, Daryl C., 764

K

Kader, Adel A., 1205
Karr, Dale B., 693
Karssen, Cees M., 591
Katz, Donald B., 841
Kaufman, Peter B., 1155
Kawabe, Kunimasa, 39
Kaye, Claudia, 390
Keegstra, Kenneth, 1193
Keller, Gregory L., 451
Kelly, Maureen O., 978
Kerbel, Eduardo L., 1205
Key, Joe L., 482, 1048, 1240
Khurana, J. P., 904
Kindinger, J. I., 67
Kinet, Jean-Marie, 1095
King, Ann I., 764
King, John, 863
Kirkby, Ernest A., 914
Kirschbaum, Miko U. F., 782
Kishinami, Isao, 266
Kitaoka, Shozaburo, 649
Klee, Harry J., 1216
Kleier, Daniel A., 803, 811
Kobayashi, Hirokazu, 137
Kobza, John, 667
Koch, Karen E., 491
Koller, H. Ronald, 517, 880
Kooijman, Ron, 216
Koon, E. Colin, 885
Kreimer, Georg, 423
Kruger, Nicholas J., 645
Kuo, Tsung Min, 1013
Kuroki, Gary, 895
Kurz, Wolfgang G. W., 447
Kutschera, Ulrich, 306

L

Labovitz, Jeffrey, 134
LaFavre, Adrienne K., 1276
Lamb, Christopher J., 182
Lambrechts, Diane, 569
Lamport, Derek T. A., 848
Lang, A. Lee, 798
Larkins, Brian A., 1281
Latzko, Erwin, 423
Lee, Youngsook, 352
Leigh, Roger A., 1257, 1315
Lejeune, Pierre, 1095
Lemoine, Remi, 575
Leonard, Robert T., 759
Leopold, A. Carl, 754, 1276
Lerma, Claudia, 54
Lers, Amnon, 1286
Lesniak, Andrew P., 1210
Li, Quanning, 429
Lieberei, Reinhard, 711
Lin, Tsan-Piao, 251, 260, 1131
Lipschultz, Claudia A., 996
Liu, Kang-Chien, 786
Lizotte, Pauline A., 322
Loescher, Wayne H., 129
Losada, Manuel, 1116
Lott, John N. A., 93
Lu, Casey R., 1155
Lugtenberg, Ben J. J., 1298
Lüthen, Hartwig, 1044

M

Macchi, Edgardo M., 1228
Macherel, David, 137
MacMillan, Jake, 857
Maheshwari, S. C., 904
Malmberg, Russell L., 390, 441
Mancinelli, Alberto L., 652, 749
Mansfield, Michael A., 1240
Markley, John L., 16
Martin, Craig E., 562
Martin, Francis, 935
Maruyama, Sachio, 1163
Masle, Josette, 32
Mason, Hugh S., 725
Masuda, Hiroshi, 312
Masuda, Yoshio, 1223
Mateyka, Christian, 417
Matringe, M., 619
Matyssek, Rainer, 1163
Mau, Yun-Hwa L., 793
Mazau, Dominique, 540
McCain, Douglas C., 16
McCann, Peter P., 224
McCarty, Richard E., 999
McFadden, J. J., 332
McFadden, Kristin M., 734
McKersie, Bryan D., 740
Medford, June I., 1216
Meinzer, Frederick C., 873
Melan, Melissa A., 469
Melander, Wayne R., 811
Melkonian, Michael, 423
Melroy, Diane L., 1089
Metzger, James D., 237
Meyer, Christopher R., 325
Mierzwa, Robert J., 841
Miller, Anita N., 822
Miller, Anthony G., 655, 677
Mimuro, Mamoru, 996
Mitchell, Cary Arthur, 826
Moffatt, Barbara, 1150
Mohapatra, Shyam S., 1005
Moll, Robert H., 778
Monz, Christopher A., 581
Moore, Anthony L., 1199
Moore, Paul H., 873
Moore, Randy, 885
Moorehead, Greg B. G., 348
Morré, D. James, 631, 1264
Mort, Andrew J., 638
Mösinger, Egon, 435, 706
Mott, Keith A., 200
Mounoury, Gilles, 899
Mudd, S. Harvey, 369
Muhitch, Michael J., 23
Mukoyama, Harutaka, 155
Mulders, Ine H. M., 1298
Mullen, Jeffrey A., 517, 880
Mullet, John E., 725
Murphy, Terence M., 830
Musgrave, Alan, 216
Musgrave, Mary E., 19
Mutschler, Martha A., 338

N

Nable, Ross O., 1136, 1143
Naylor, Aubrey W., 143, 147, 152
Nelson, Curtis J., 1070, 1077
Nelson, Nathan, 1

Ngam-ek, Apinya, 104
Ngernprasirtsiri, Jarunya, 137
Nguyen, Tien T., 104
Nield, Hilary, 93
Nikolau, Basil J., 451
Norcini, Jeffrey G., 1236
Nothnagel, Eugene A., 429

O

O'Connell, Keith M., 359
Ogura, Kiyoshi, 155
Ohlrogge, John B., 1174
Ohta, Yoshimoto, 176
Onishi, Toshio, 649
Opella, Stanley J., 134
Ortiz, William, 554
Osborn, Thomas C., 399
Osmond, C. Barry, 117
Osswald, Wolfgang F., 1310
Ostrem, James A., 1002
Ozias-Akins, P., 602

P

Palevitz, Barry A., 412
Palmer, Raymond L., 1270
Park, Roderic B., 1089
Parkhurst, David F., 1032
Pate, John S., 204
Patterson, Glenn W., 822
Pearcy, Robert W., 782
Peeler, Thomas C., 143, 152
Peeler, Thomas C., 147
Perdue, Donna O., 1276
Pesci, Pierantonio, 927
Pettersson, Annette, 112
Peumans, Willy J., 569, 598, 922
Phinney, Bernard O., 857
Plaxton, William C., 348, 1064
Pönsgen-Schmidt, Emma, 457
Poole, Ronald J., 1005
Poovaiah, B. W., 332
Pope, Andrew J., 1315
Portis, Archie R., Jr., 293
Poulton, Jonathan E., 319, 322
Pradet, Alain, 61
Preiss, Jack, 251, 260, 1131
Price, Neil M., 192
Prioul, J. L., 990
Puntarulo, Susana, 626
Purvis, Albert C., 623
Pythoud, Francois, 584

Q

Qu, Rongda, 270
Quatrano, Ralph S., 208

R

Rabin, Jack, 329
Radin, John W., 908
Ramstedt, Mauritz, 935
Randall, Douglas D., 1084
Rasmussen, Jack B., 187
Rea, Philip A., 1257
Reaney, Martin J. T., 344
Reid, Michael S., 764
Reinecke, Dennis M., 868
Rendina, Alan R., 983
Riege, Heike, 769
Riov, Joseph, 13
Roberts, Justin K. M., 1127
Robertson, Albert J., 344
Robinson, Simon P., 293
Rogers, Kim R., 547
Rogers, S. G., 602
Rogers, Stephen G., 1216
Romani, Roger J., 1205
Romero, Teresa, 643
Ross, Peter, 1099, 1104
Roy, Harry, 44, 50
Rumeau, Dominique, 540
Rumpho, Mary E., 1193
Rustin, Pierre, 325

S

Saglio, Pierre H., 61
Sánchez, Rodolfo A., 626
Sanders, Dale, 1257
Sapanara, Victoria, 1281
Sato, Naoki, 931
Satter, Ruth L., 352
Saxena, Praveen K., 863
Saxton, Michael J., 993
Scalla, R., 619
Schäfer, Eberhard, 435, 706
Schaller, G. Eric, 512
Scheffer, Robert P., 187
Scheld, H. William, 19
Scherer, Siegfried, 769
Schmidt, Gregory W., 412
Schmitt, Juergen M., 1002
Schnarrenberger, Claus, 417
Schneegurt, Mark A., 497
Schneider, Diane M., 134
Schneider, Toni, 457
Schnyder, Hans, 1070, 1077
Schütz, Wolfgang, 1310
Schwintzer, Christa R., 581
Scolnik, Pablo A., 7
Secor, Jacob, 10
Seemann, Jeffrey R., 667
Selmar, Dirk, 711
Serrano, Aurelio, 1116
Shannon, Jack C., 786
Shannon, Leland M., 1027
Shannon, L. M., 67
Sharkey, Thomas D., 667
Sheen, Jenq-Yunn, 1020
Shibasaka, Mineo, 1008
Shibles, Richard, 108
Shigeoka, Shigeru, 649
Shinkle, James R., 960
Sinclair, Thomas R., 124
Sinkar, Vilas P., 584
Sitaraman, Kalavathy, 1323
Sitrit, Yaron, 13
Slovin, Janet Pernise, 522
Smillie, Robert M., 1108
Smith, Ivan K., 798
Smrcka, Alan V., 615
Smucker, Alvin J. M., 885
Söderhäll, Kenneth, 935
Somerville, Chris, 1131, 1150
Song, Il, 1155
Spencer, Mary S., 510
Spilatro, Steven R., 251
Spiller, Hart, 1185
Spollen, William G., 1077
Spray, Clive R., 857
Spreitzer, Robert J., 773, 987
Staehelin, L. Andrew, 270
Stewart, Ann, 93
Stinemetz, Charles L., 885
Storer, Paul J., 204
Stout, Darryl G., 275, 283
Strain, Boyd R., 19
Stuhlfauth, Thomas, 246
Sugawara, Shiro, 312
Sültemeyer, Dieter F., 246
Sussman, Michael R., 512, 841
Suttle, Jeffrey C., 241

T

Tabaeizadeh, Z., 602
Takahashi, Nobutaka, 857
Takahashi, Toshimasa, 312
Takeshige, Kazuhiko, 1168
Tamot, B. K., 904
Tan, Zhi-Yi, 341
Tanaka, Charlene K., 717
Taylor, George E., Jr., 85
Taylor, Scott, 700
Tazawa, Masashi, 1168
Terhune, Brian T., 848
Testa, M. Pia, 1127
Teyker, Robert H., 778
Thimann, Kenneth V., 341
Thomas, Paul A., 786
Thomas, Terry L., 527
Thompson, William F., 299
Tittle, Forrest T., 510
Tjepkema, John D., 581
Toivonen, Peter, 744
Tolbert, N. E., 98
Trelease, Richard N., 527
Tremolieres, A., 967
Trewavas, Anthony J., 505
Tsai, Charles Y., 1323
Tsuji, Hideo, 1008
Tsujita, M. James, 355
Tsumuraya, Yoichi, 155
Tu, Chingkuang, 1185
Turpin, David H., 688
Tyson, Hugh, 288

U

Ueng, Peter, 1281
Ulrich, Thomas H., 451, 482

V

Van Beusichem, Marinus L., 914
van Brussel, Anton A. N., 1298
Van Damme, Els J. M., 598, 922
Van den Ende, Herman, 216
Van Dijck, R., 836
Van Roekel, Tineke, 4
Vartanian, Nicole, 1304
Vasil, Indra K., 602
Vasil, V., 602
Verbelen, Jean-Pierre, 569
Vernon, Daniel M., 1002
Vidaver, William, 744
Vigh, László, 335
Virgona, James M., 1108
Volenec, Jeffrey J., 1247
Volk, Richard J., 778

W

Waines, J. Giles, 759
Wall, Luis G., 1228
Wang, Wei-Yeh, 793
Wang, Wei-Zhong, 562
Ward, Michael R., 166
Warren, Herman L., 1323
Wedding, Randolph T., 325
Weger, Harold G., 688
Weigel, Pierre, 54
Weinberger-Ohana, Patricia, 1099, 1104
Weinz, Stefanie, 246
Welbaum, Gregory E., 406
White, Frank F., 584
Widholm, Jack M., 266
Wiedenhoeft, Ruth E., 412
Wijffelman, Carel A., 1298
Wildung, Raymond E., 734
Williamson, John D., 208
Wilson, Charles J., 554
Winkler, Rodney G., 1084

Wintermans, Jef F. G. M., 971
Wiskich, Joseph T., 1199
Wold, Matthew P., 394
Wong, Suan-Chin, 1032
Wu, Cathy H., 1323
Wurtele, Eve Syrkin, 451
Wynns, George Clifford, 1185
Wyse, Roger, 575

Y

Yamamoto, Ryoichi, 1223
Yamamoto, Shigeru, 155
Yamane, Hisakazu, 857
Yarrow, Gary L., 71
Yokota, Akiho, 649
Yousif, Abdullah E., 1193

Z

Zaat, Sebastian A. J., 1298
Zabala, Gracia, 817
Zeiger, Eduardo, 700
Zelitch, Israel, 463
Zhang, Donghong, 987
Ziegler, Paul, 659

Plant Physiol. (1988) 86, xxvi–xxxvi
0032-0889/88/86/xxvi/$01.00/0

Subject Index

A

ABA (*see* Abscisic acid)
Abscisic acid
  effect of shading, soybean reproductive structures, 71
  indole-3-acetic acid and, abscission zones and moisture stress, cotton, 28
  ion fluxes and, proline accumulation, barley leaf segments, 927
  movement into apoplastic solution, water-stressed cotton leaves, 908
  regulation of embryo-specific sequences, mature wheat embryos, 208
  water relations and yield, transplant shock, bell pepper, 329
Acclimation
  cold
    bulk tissue electrical impedance, alfalfa, 283
    bulk tissue electrical impedance, birdsfoot trefoil, 275, 283
Acer platanoides (*see* Norway maple)
Acer pseudoplatanus (*see* Sycamore)
Acetolactate synthase, activity in developing maize kernels, 23
Acetyl-coenzyme A carboxylase
  cyclohexanedione herbicides, grasses, 983
  inhibition of, haloxyfop and tralkoxydim, corn, 10
Acetylene, time course of reduction, nodules of five actinorhizal genera, 581
Acid, phloem mobility of xenobiotics, 803
Acidification, kinetics in aleurone layer, solubilization, starchy endosperm of wheat, 643
Acifluorfen-methyl, mode of action, nonchlorophyllous soybean cells, 619
Actinorhizal nodules, time course of acetylene reduction, 581
Acyl carrier protein, regulation of mRNA levels, seed and leaf development, spinach, 1174
Adenine phosphoribosyl transferase, lack of activity, positive selection, male-sterile *Arabidopsis* mutants, 1150
Adenosine triphosphatase
  cytochemical localization, oat roots, 841
  membrane fractions in barley roots, separation, immunological characterization, 717
  nitrate uptake; pea chloroplasts, 384
  tonoplast H^+-pump
    early ethylene activation, latex from rubber tree, 899
    perfusion technique, *Chara corallina*, 1168
Adenosine triphosphate
  -dependent fructose 6-phosphate 1-phosphotransferases, pyrophosphate, molecular comparison in potato, 645
  light-harvesting chlorophyll *a/b* protein, pea, 1120
  proton-ATPases, structure, function and evolution, 1
  quantitative estimation of proton fluxes, membrane vesicles, 1257
  stromal, rubisco, spinach chloroplasts, 293
ADPglucose, starch and, comparison, carrot, 451
ADPglucose pyrophosphorylase, lack of activity, starchless mutant, *Arabidopsis thaliana*, 1131
Agglutinin
  light-regulated agglutinability, *Chlamydomonas eugametos*, 216
  release upon imbibition, Jimson weed seed, 569
  Urtica dioica, complex mixture of isolectins, 598
Aging, celery leaf, biosynthesis, sucrose and mannitol, 129
Agrobacterium rhizogenes, reversion of aberrant plants, transcriptional inactivation, T_L-DNA genes, 584
Air, adaptations, respiration, rice seedlings, 1008
Alcohol dehydrogenase
  decrease, allyl alcohol, tobacco, 266
  metabolic acclimation to anoxia, hypoxia, corn, 61
Aleurone
  barley, α-amylase synthesis, hypochlorite influence, 510
  kinetics of acidification, solubilization of reserves, starchy endosperm of wheat, 643
Alfalfa
  bulk tissue electrical impedance, effect of cold acclimation, 275
  cold treatment, alterations, membrane protein-profile, 1005
  root hair cell walls, barriers to infection, rhizobia, 638
Algae
  δ-aminolevulinic acid, RNA required for biosynthesis, glutamate, 497
  ammonium assimilation, mitochondrial respiration, light, 688
  blue-green, action spectra, nitrate and nitrite assimilation, 1116
  Chlamydomonas eugametos, light-regulated agglutinability, 216
  Euglena gracilis, heat bleaching, chloroplast protein accumulation, 554
  N-terminus conservation, terminal pigment, phycobilisomes, 996
  Porphyra, fluorescence characteristics, photoinhibition, 946
  stereoisomers of β-carotene and phytoene, 1286
Alkaline invertase, acid and, beet, 312
Alkaline phosphatase, derepressible, purification, *Anacystis nidulans*, 1179
Alkaloids
  indole biosynthesis, developmental regulation, *Catharanthus roseus*, 447
  pyrrolizidine, ornithine decarboxylase, *Senecio* and *Crotalaria*, 224
  stimulation of sanguinarine production, *Papaver bracteatum*, 161
Allantoate amidohydrolase, ureide catabolism in soybeans, 1084
Allopurinol, nitrogen assimilation in cowpeas, 204
Allyl alcohol, selection for lower alcohol dehydrogenase activity, tobacco, 266
Alnus, time course of acetylene reduction, 581
Alocasia macrorrhiza, gas exchange analysis, photosynthetic induction, stomatal and biochemical factors, 782
Aluminum
  effects of cations on hormone transport, corn roots, 890
  uptake and metabolism of phosphorus, *Anabaena cylindrica*, 112
α-Amanitin, ABA-regulation, embryo-specific sequences, mature wheat embryos, 208
Ambrosia trifida (*see* Ragweed)
Amino acids
  lectins from *Sophora japonica* bark, 67
  metabolism during glucose utilization, *Sphaerosporella brunnea*, 935
  N-terminus conservation, phycobilisomes, alga, 996
1-Aminocyclopropane-1-carboxylic acid, interference with assay, phenolic compounds, avocado, 13
δ-Aminolevulinic acid
  biosynthesis in *Chlamydomonas reinhardtii*, 793
  RNA required for biosynthesis, glutamate, algae, 497
Ammonia, nitrogen uptake, wheat seedlings, 166
Ammonium
  assimilation in alga, mitochondrial respiration, light, 688
  nitrate and, uptake and assimilation, castor bean, 914
α-Amylase, influence of hypochlorite on synthesis, barley aleurone layers, 510
Amylases, subcellular localization, characterization, *Arabidopsis thaliana* leaf, 251
Amyloplasts
  chloroplast DNA and, sycamore, 137
  corn kernel, enzyme activities, 786
Anabaena cylindrica, aluminum effects, uptake and metabolism, phosphorus, 112
Anabaena variabilis (*see* Cyanobacterium)
Anacystis nidulans
  active transport of carbon dioxide, measurement by mass spectrometry, 677
  derepressible alkaline phosphatase, identification, purification, 1179
Anaerobiosis, role of phosphoenolpyruvate-carboxykinase, *Euglena gracilis*, 457
Anoxia, metabolic acclimation, hypoxia in root tips, corn, 61
Anthocyanin, production, chlorophyll-rich and -poor seedlings, cabbage, 652
Apium graveolens (*see* Celery)
Arabidopsis thaliana
  amylases, subcellular localization, characterization, 251
  characterization of D-enzyme, 260
  development, plant transformation selection system, gentamicin acetyltransferases, 1216

dual effect of light, gibberellin- and nitrate-stimulated seed germination, 591
isolation and characterization of starchless mutant, lack of ADPglucose pyrophosphorylase activity, 1131
positive selection for male-sterile mutants, lack of adenine phosphoribosyl transferase activity, 1150
Arabinogalactan-proteins, primary and mature roots of radish, 155
Arcelin, bean seed protein, purification and characterization, 399
Arsenite, heat shock-specific poly(A)$^+$ RNAs, soybean seedlings, 1048
Aspartate, floral induction, *Lemna paucicostata*, 904
Assays
1-aminocyclopropane-1-carboxylic acid, interference by phenolic compounds, avocado, 13
NMR spectroscopy (*see* Nuclear magnetic resonance spectroscopy)
purification of indole-3-acetic acid, prior to GC-SIM-MS analysis, oat, 822
spectrophotometric, phosphoenolpyruvate carboxylase activity, *Crassula argentea*, 325
Assimilate, export at night, soybean leaves, 517
Auxins
disruption of transport, thidiazuron, cotton seedlings, 241
growth/*in vivo* extensibility/tissue tension, pea internodes, 306
-induced growth, galactose inhibition, mono- and dicotyledonous plants, 1223
-stimulated NADH oxidase, plasma membrane, soybean, 1264
Avena sativa (*see* Oat)
Avocado, 1-aminocyclopropane-1-carboxylic acid assay, interference, phenolic compounds, 13
Azuki bean, galactose inhibition of auxin-induced growth, 1223

B

Bark
Sophora japonica
lectins, 67
lectin sequestering, protein-storage vacuoles, 1027
Barley
aleurone layers, hypochlorite, influence on amylase synthesis, 510
galactose inhibition of auxin-induced growth, 1223
grains and seedlings, mineral content, 93
inhibitors of acetyl-CoA carboxylase, cyclohexanedione herbicides, 983
leaf
proline accumulation, ion fluxes and abscisic acid, 927
urease induction, 941
phytochrome regulation of greening, 706
chlorophyll accumulation, 435
root
membrane fractions, separation, 717
Na^+/H^+ antiport, tonoplast vesicles, 231
starch statoliths, gravisensors, pulvini, 1155
Bean
arcelin seed protein, purification and characterization, 399
chitinase mRNA induction, 182
leaf mesophyll, intercellular carbon dioxide levels, 1032
lipid peroxidation, elicitor activity, 547
Beet
acid and alkaline invertases, 312
glycolytic enzyme binding, metabolic dependence, 348
immature tap roots, sucrose carrier, 575
Betaine, choline oxidation, spinach chloroplasts, 54
Beta vulgaris (*see* Beet)
Birdsfoot trefoil, bulk tissue electrical impedance, effect of cold acclimation, 275
Bradyrhizobium japonicum, efficiency of nodule initiation, cowpea and soybean, 1121
Brassica chinensis, leaf mesophyll, intercellular carbon dioxide levels, 1032
Brassica oleracea (*see* Cabbage)
Broad bean, guard cell protoplasts, photosynthetic carbon fixation, 700
Bromegrass, freezing tolerance, protein profiles, 344
Bromeliads, initiation of lateral shoot growth, role of ethylene and cytokinins, 836
Bromus inermis (*see* Bromegrass)
Bundle sheath cells
corn and spinach, α-glucan phosphorylases, 417
maize, photosystem II, plastid genome, 1020
various plants, carbonic anhydrase, C_4 pathway, 1252

C

C_3, *Digitalis lanata*, water stress, fluorescence quenching, 246
C_3-C_4, chloroplast phosphate translocator, 1193
Cabbage
chlorophyll-rich and -poor seedlings, anthocyanin production, 652
phytochrome photoconversion, measured and predicted rates, 749
Cadmium
complexation of cations, soybean xylem exudates, 734
heat shock-specific poly(A)$^+$ RNAs, soybean seedlings, 1048
Calcium
effects of cations on hormone transport, corn roots, 890
free, stromal concentration, fructose-1,6-bisphosphatase activation in spinach, 423
inhibition of stem elongation, blue light, 960
mineral content, barley grains and seedlings, 93
regulation of gravitropism by light, corn, 1276
Calcium channel, effect of 1,4-dihydropyridines, development of gametophore buds, moss, 684
Callus, melon, hydroxyproline-rich glycoproteins, 540
Calmodulin, metal ion-induced root curvature, corn, 885
CAM plants, sun and shade grown, internal carbon dioxide supply, photoinhibition, 117
CAM-recycling, ecophysiological significance, CAM metabolism, *Talinum calycinum*, 562
Cantaloupe, callus, hydroxyproline-rich glycoproteins, 540
Capsium annuum (*see* Pepper)
Carbohydrates
amino acid metabolism, glucose utilization, *Sphaerosporella brunnea*, 935
depletion, assimilate export at night, soybean leaves, 517
diurnal growth of tall fescue leaf blades, 1077
role in diurnal chilling sensitivity, tomato seedlings, 764
Carbon
daytime and nighttime balance, assimilate export, soybean leaves, 880
isotope discrimination, soil strength and water-use efficiency, wheat seedlings, 32
partitioning, photoperiodic and genetic control, pea, 978
photosynthetic fixation, guard cell protoplasts, broad bean, 700
respiratory loss, assimilate export at night, soybean leaves, 517
split-root VA mycorrhizal symbiosis, net leaf phosphorus accumulation, Carrizo citrange, 491
Carbon dioxide
active transport, cyanobacterium, 677
assimilation and photosynthetic enzymes, low ribulose 1,5-bisphosphate carboxylase, corn, 533
assimilation in soybean, physiological site, ethylene effects, 85
CAM-recycling, ecophysiological significance, *Talinum calycinum*, 562
elevated concentrations, glycolysis, pear, 1205
ethylene and, stimulation of seed germination, cocklebur, 39
Glycine-Glomus-Rhizobium symbiosis, 1292
HCO_3^- transport and, chlorophyll *a* fluorescence, cyanobacterium, 655
intercellular levels, leaf mesophyll, various plants, 1032
light-induced proton release, cyanobacterium, 769
low level for *Chlamydomonas reinhardtii*, glutathione peroxidase, selenium, 649
photosynthesis of sun and shade grown CAM plants, relation to photoinhibition, 117
stomatal responses, sunflower and cocklebur, 200
uptake in water-stressed white spruce seedlings, variable chlorophyll *a* fluorescence, 744
whole plant gas analysis, nondestructive estimation of growth, tomato and rose, 355
Carbonic anhydrase
low bundle sheath, effective C_4 pathway operation, various plants, 1252
role of photosynthetic reactions, light, *Synechococcus*, 1185
2-Carboxyarabinitol 1-P, HPLC and indirect ultraviolet detection, phosphorylated sugars, 615
Carnation, interference of phenolic compounds, 1-aminocyclopropane-1-carboxylic acid assay, avocado, 13
β-Carotene, phytoene and, stereoisomers, alga *Dunaliella bardawil*, 1286
Carotenoid, chloroplast differentiation, nuclear gene expression, tomato, 7

Carrizo citrange, vesicular-arbuscular mycorrhizal symbiosis, carbon cost, net leaf phosporus accumulation, 491
Carrot
glycolytic enzyme binding, metabolic dependence, 348
initiation of cell wall digestion, plasma membrane protein phosphorylation, 505
nonembryogenic cells and developing embryos, comparison, starch and ADPglucose pyrophosphorylase, 451
Castor bean
dihydroxyacetone phosphate reductase, 98
germinating endosperm, purification, pyruvate kinase, 1064
nitrate and ammonium nutrition, 914
Casuarina, time course of acetylene reduction, 581
Catharanthus roseus, indole alkaloid biosynthesis, developmental regulation, 447
Cations
complexation, soybean xylem exudates, 734
effects on hormone transport, primary roots of corn, 890
Ceanothus, time course of acetylene reduction, 581
Celery, leaf age, biosynthesis, sucrose and mannitol, 129
Cell wall
changes in components with chase time, UDPglucose, intact cotton fibers, 1270
extensin monomers and oligomers, characterization, tomato/cucumber/sycamore-maple, 848
initiation of digestion, plasma membrane protein phosphorylation, carrot, 505
pea epicotyl growth, antibodies, 469
rapid relaxation, elongating tissues, soybean, 1163
root hair, potential barriers to infection, various plants, 638
Chara corallina, tonoplast proton ATPase and pyrophosphatase, perfusion technique, 1168
Chemotaxis, efficiency of nodulation, *Rhizobium meliloti*, 1228
Chenopodium album, triazine resistant mutants, variation, transhexadecenoic acid content, 967
Chilling
diurnal, carbohydrate role in sensitivity, tomato seedling, 764
pea and cucumber leaves
leaf gas exchange, 143
thylakoid electron transfer, 147
variable fluorescence, dark adaptation temperature, 152
Chitinase, mRNA induction, bean, 182
Chlamydomonas eugametos, light-regulated agglutinability, 216
Chlamydomonas reinhardtii
biosynthesis of δ-aminolevulinic acid, 793
low-carbon dioxide-grown, glutathione peroxidase, selenium as inducer, 649
missense mutation in chloroplast gene, rubisco large subunit, 987
photosynthesis-deficient mutants, temperature sensitivity, 773
trimethylhomoserine lipid biosynthesis, 931
Chlorate, kinetics of uptake, XD tobacco cells, 817
Chlorine, intracellular compartmentation of ions, salt-adapted tobacco cells, 607
Chloroacetanilide, rates of metabolism in corn, 359
Chlorophyll
accumulation, phytochrome regulation of greening, barley, 435
a fluorescence
carbon dioxide and HCO_3^- transport, cyanobacterium, 655
carbon dioxide uptake, water-stressed white spruce seedlings, 744
drought acclimation, sunflower, 1108
high fluorescence, photosynthetic enzymes, corn, 533
light-harvesting *a*/*b* protein, assembly, pea, 1120
phytochrome regulation of greening
barley, 706
pea, 299
-rich and -poor cabbage seedlings, anthocyanin production, 652
separation from pigment extracts, chromatography, *Pavlova gyrans*, 76
Chloroplasts
Chlamydomonas reinhardtii, missense mutation, rubisco large subunit, 987
corn, C_3 and C_4 phosphate translocator, 1193
Euglena gracilis, protein accumulation, heat bleaching, 554
inner envelope vesicles of pea and spinach, proton-linked transport, pyranine, 999
Norway maple, sun and shade leaves, water allocation, 16
pea
incorporation of large sununits, ribulose bisphosphate carboxylase, 44
nitrate uptake, 378, 384
photosynthesis and, soybean leaf senescence, 108
proton-ATPases, structure, function and evolution, 1
spinach
choline oxidation, 54
fructose-1,6-bisphosphatase activation, stromal free calcium, 423
stromal ATP, light activation of rubisco, 293
synthesis, mono- and digalactosyldiacylglycerol, 971
St. Augustine grass, guard cells, absence of variable fluorescence, 429
sycamore, DNA, amyloplast, 137
tomato, differentiation, nuclear gene expression, 7
Choline, oxidation, spinach chloroplasts, 54
Chorismate mutase, increased levels after wounding, potato tubers, 895
Chromatography
HPLC, indirect ultraviolet detection and, phosphorylated sugars, 615
reversed-phase high performance liquid, chlorophyll separation, *Pavlova gyrans*, 76
Cibotium glaucum (*see* Fern)
Circadian rhythm, H^+ uptake and release, temperature effects, *Samanea* motor organs, 352
Citrus paradisi (*see* Grapefruit)
Citrus sinensis, split-root VA mycorrhizal symbiosis, carbon cost, net leaf phosporus accumulation, 491
Clathrin, soybean, dissociation and reassembly, 412
Cocklebur
seed germination, stimulation of, carbon dioxide and ethylene, 39
stomatal responses to carbon dioxide, 200
Cold
acclimation
bulk tissue electrical impedance, alfalfa, 283
bulk tissue electrical impedance, birdsfoot trefoil, 275, 283
alterations in membrane protein-profile, alfalfa, 1005
Coleoptiles, corn, rates of metabolism, chloroacetanilide herbicides, 359
Corn
bundle sheath and mesophyll cells, photosystem II, plastid genome, 1020
calcium in regulation of gravitropism by light, 1276
C_3 and C_4 chloroplast phosphate translocator, 1193
carbon dioxide assimilation, photosynthetic enzymes, ribulose 1,5-bisphosphate carboxylase, 533
carbonic anhydrase in C_4 photosynthesis, 1252
developing kernels, enzymes, sucrose and hexose metabolism, 1013
different rates of metabolism, chloroacetanilide herbicides, 359
dihydroxyacetone phosphate reductase, 98
galactose inhibition of auxin-induced growth, 1223
hormone action, transmembrane electron, proton transport, 1038
inhibitors of acetyl-CoA carboxylase
cyclohexanedione herbicides, 983
haloxyfop and tralkoxydim, 10
kernel amyloplasts, enzyme activities, 786
kernels, development, acetolactate synthase activity, 23
leaf, translational alterations, stress, 1323
lipid bodies, L3 protein localization, germination and growth, 270
mesophyll and bundle sheath cells, α-glucan phosphorylases, 417
metal ion interactions
phosphoenolpyruvate carboxylase, 104
root curvature, 885
nitrate transport, nitrogen deprivation, 778
oxidation of indole-3-acetic acid, oxindole-3-acetic acid, 868
root
effects of cations, hormone transport, 890
gravity signal, protein phosphorylation, 332
hexachloroiridate IV, plasmalemma redox system, 1044
nitrate absorption, inhibition by phenylglyoxal, 759
root hair cell walls, barriers to infection, rhizobia, 638
root tips, hypoxia, metabolic acclimation to anoxia, 61
seedling, NMR spectroscopy, roots of intact plants, 1127
sporopollenins, NMR spectroscopy, 134
storage protein gene, expression in petunia plants, 1281
translocation from kernel to shoot, indole-3-acetic acid, indole-3-acetyl-*myo*-inositol, 79
Cotton

intact fibers, cell wall components, UDPglucose incorporation, 1270
leaf, water stress, abscisic acid movement, 908
leaf mesophyll, intercellular carbon dioxide levels, 1032
root hair cell walls, potential barriers to infection, various plants, 638
seedlings, defoliants, auxin transport, 241
Cotyledons, cucumber, phytochrome photoconversion, 749
Cowpea
efficiency of nodule initiation, 1210
nodules, nitrogen assimilation, 204
Crassula argentea
metal ion interactions, phosphoenolpyruvate carboxylase, 104
phosphoenolpyruvate carboxylase activity, spectrophotometric assay, 325
Cress, glucosinolate biosynthesis, 319
Crocin, bleaching, indole-3-acetic acid oxidation, horseradish peroxidase, 1310
Crotalaria, ornithine decarboxylase, polyamines, pyrrolizidine alkaloids, 224
Crowns, winter wheat, ice-encasement injury, microsomal membranes, 740
Cucumber
chilling effects
leaf gas exchange, 143
thylakoid electron transfer, 147
variable fluorescence, dark adaptation temperature, 152
extensin monomers and oligomers, characterization, 848
galactose inhibition of auxin-induced growth, 1223
phytochrome photoconversion, measured and predicted rates, 749
seedling, inhibition of stem elongation by blue light, calcium, 960
Cucumis melo (*see* Cantaloupe, Muskmelon)
Cucumis sativus (*see* Cucumber)
Cucurbita moschata (*see* Squash)
Cucurbita pepo (*see* Pumpkin)
Cyanobacterium
active transport of carbon dioxide, measurement by mass spectrometry, 677
Anabaena cylindrica, aluminum effects, phosphorus metabolism, 112
chlorophyll *a* fluorescence, carbon dioxide and HCO_3^- transport, 655
light-induced proton release, 769
Cyclohexandione, herbicides, inhibitors of acetyl-CoA carboxylase, grasses, 983
Cycloheximide, ABA-regulation, embryo-specific sequences, mature wheat embryos, 208
Cytochrome *f*, plastoquinone mobility, thylakoid fluidity, pea, 355
Cytokinins
ethylene and, lateral shoot growth, bromeliads, 836
fluxes during floral induction, *Sinapis alba*, 1095
Cytoplasm
distribution of heat shock proteins, soybean, 1240
proton-ATPases, structure function and evolution, 1
Cytosol, spinach, equivalence to corn, α-glucan phosphorylases, 417

D

Dark, adaptation temperature, variable fluorescence and chilling, pea and cucumber, 152
Datisca, time course of acetylene reduction, 581
Datura innoxia, herbicide resistance, 863
Datura stramonium (*see* Jimson weed)
Daucus carota (*see* Carrot)
Davillia trichomanoides (*see* Squirrel's foot fern)
Defoliants, thidiazuron, polar auxin transport, cotton seedlings, 241
Deoxyribonucleic acid
amyloplast and chloroplast, sycamore, 137
complementary, chitinase mRNA induction, bean, 182
expression of maize storage protein gene, petunia plants, 1281
transcriptional inactivation, tobacco transformation, *Agrobacterium rhizogenes*, 584
Desulfobenzylglucosinolate, sulfation of, cress seedlings, 319
Diacetylenic compounds, elicitation, eggplant, 176
Diacylglyceryltrimethylhomoserine, dual role of methionine in biosynthesis, *Chlamydomonas reinhardtii*, 931
Dianthus caryophyllus (*see* Carnation)
Diatoms, *Thalassiosira pseudonana*, selenium-containing macromolecules, 192
Dicksonia antarctica (*see* Fern)
Digalactosyldiacylglycerol, synthesis in spinach chloroplasts, 971
Digitalis lanata, water-stressed, fluorescence quenching, 246
1,4-Dihydropyridines, effect on initiation and development, gametophore buds, moss, 684
Dihydroxyacetone phosphate reductase, corn/soybean/pea/spinach, 98
Disinfection, influence of hypochlorite, α-amylase synthesis, barley aleurone layers, 510
DNA (*see* Deoxyribonucleic acid)
Dopamine, stimulation of sanguinarine production, *Papaver bracteatum*, 161
Drought (*see* Water stress)
Dunaliella bardawil, stereoisomers of β-carotene and phytoene, 1286

E

Eggplant, elicitation of diacetylenic compounds, 176
Electrical impedance
effect of cold acclimation on bulk tissue
alfalfa, 283
birdsfoot trefoil, 275, 283
Electron microscopy
extensin monomers and oligomers, characterization, tomato/cucumber/sycamore-maple, 848
localization of mRNAs, rubisco subunits, tobacco, 990
Electrophoresis, preparative free-flow, plasma membrane vesicles, sidedness from soybean hypocotyls, 631
Elicitors, lipid peroxidation, bean, 547
Endoamylase, partial purification and characterization, mature pea leaves, 659
Endocytosis, receptor-mediated, plants, 993
Endophytes, *Glycine-Glomus-Rhizobium* symbiosis, 1292
Endosperm
germinating castor bean, purification, pyruvate kinase, 1064
lettuce, embryo growth, effect of salicylhydroxamic acid, 826
wheat, solubilization of reserves, kinetics of acidification, 643
Enzymes (*see also* specific types)
D-, characterization in *Arabidopsis thaliana* leaf, 260
glycolytic, binding to particulate fraction, carrot and beet, 348
Epidermis, growth/*in vivo* extensibility/tissue tension, pea internodes, 306
Ethylene
carbon dioxide and, stimulation of seed germination, cocklebur, 39
cytokinins and, lateral shoot growth, bromeliads, 836
effects on growth rate of pollen tubes, petunia, 4
interference of phenolic compounds, 1-aminocyclopropane-1-carboxylic acid assay, avocado, 13
physiological site of effects, carbon dioxide assimilation, soybean, 85
tonoplast H^+-pumping ATPase, latex, rubber tree, 899
Eucalyptus pauciflora, leaf mesophyll, intercellular carbon dioxide levels, 1032
Euglena gracilis
dark anaerobiosis, phosphoenolpyruvate-carboxykinase, 457
heat bleaching, chloroplast protein accumulation, 554
Extensin, monomers and oligomers, characterization, tomato/cucumber/sycamore-maple, 848

F

Fat, metabolism, nonphosphorylating electron transport, soybean cotyledon mitochondria, 1199
Fern, endogenous gibberellins from sporophytes, 857
Fescue
leaf, fructan content and synthesis, 1247
tall leaf blades, diurnal growth, 1070, 1077
Festuca arundinacea (*see* Fescue)
Flaveria linearis, cytosolic fructose-1,6-bisphosphatase activity, loss of oxygen sensitivity, 667
Flax, elimination of isoperoxidase mobility differences, α-mannosidase, 288
Flower
induction
cytokinin fluxes, *Sinapis alba*, 1095
Lemna paucicostata, 904
normal and abnormal morphologies, polyamine levels, petunia, 390
Fluorescence
absence of variable type, guard cell chloroplasts, St. Augustine grass, 429
carbon dioxide assimilation, photosynthetic enzymes, corn, 533
characteristics of photoinhibition and recovery, sun and shade species, red algae, 946
chlorophyll *a*, carbon dioxide uptake, water-stressed white spruce seedling, 744
quenching, water-stressed *Digitalis lanata*, 246
variable, dark adaptation temperature and chilling, pea and cucumber, 152
Freezing
alterations in membrane protein-profile, alfalfa, 1005

tolerance, protein profiles, bromegrass, 344
Fructan
content and synthesis, fescue leaf tissues, 1247
diurnal growth of tall fescue leaf blades, 1077
Fructose, corn kernel amyloplasts, enzyme activities, 786
Fructose-1,6-bisphosphatase
light-mediated activation, stromal free calcium concentration, spinach, 423
reduced cytosolic activity, loss of oxygen sensitivity, *Flaveria linearis*, 667
Fructose 6-phosphate, HPLC and indirect ultraviolet detection, phosphorylated sugars, 615
Fructose 6-phosphate 1-phosphotransferases, pyrophosphate- and ATP-dependent, molecular comparison, potato tuber, 645
L-Fucose, arabinogalactan-proteins, primary and mature roots, radish, 155
Funaria hygrometrica (*see* Moss)

G

Galactose, inhibition of auxin-induced growth, mono- and dicotyledonous plants, 1223
Galanthus nivalis (*see* Snowdrop)
Gametophore buds, initiation and development in moss, effect of 1,4-dihydropyridines, 684
Gas exchange
CAM-recycling, ecophysiological significance, *Talinum calycinum*, 562
chilling effects, pea and cucumber leaves, 143
photosynthetic induction, stomatal and biochemical factors, *Alocasia macrorrhiza*, 782
whole plant carbon dioxide measurements, nondestructive estimation of growth, tomato and rose, 355
Genes
gentamicin acetyltransferases, plant transformation selection system, 1216
nodulation, root exudates, *Rhizobium leguminosarum*, 1298
nuclear, chloroplast differentiation, tomato, 7
pyruvate,pi dikinase gene, cell-specific expression, wheat seed, 364
starchless mutant of *Arabidopsis thaliana*, lack of ADPglucose pyrophosphorylase activity, 1131
Gentamicin acetyltransferases, development, plant transformation selection system, 1216
Germination
cocklebur seed, interrelations, carbon dioxide and ethylene, 39
growth and, L3 protein localization, maize lipid bodies, 270
low pressure, growth and mitochondrial respiration, mung bean, 19
onset in soybean embryonic axes, hydrogen peroxide metabolism, 626
photoinduced, *Oenothera biennis* seed, 475
seed, light effect, *Sisymbrium officinale* and *Arabidopsis thaliana*, 591
seed development and, water relations, muskmelon, 406
Gibberellins
dual effect of light, seed germination, *Sisymbrium officinale* and *Arabidopsis thaliana*, 591
endogenous, sporophytes of tree ferns, 857
light-regulated petiole growth and, pennycress, 237
Glomus mosseae, *Glycine-Glomus-Rhizobium* symbiosis, 1292
β-Glucan
β-glucoside activators, mung bean UDPglucose, 1099, 1104
UDPglucose incorporation, cell wall components, intact cotton fibers, 1270
4-α-Glucanotransferase, characterization in *Arabidopsis thaliana* leaf, 260
α-Glucan phosphorylases, corn and spinach, mesophyll and bundle sheath cells, 417
Glucose
corn kernel amyloplasts, enzyme activities, 786
utilization in *Sphaerosporella brunnea*, carbohydrate and amino acid metabolism, 935
Glucosinolate, biosynthesis in cress, 319
Glucosylation, cyanogenic glycosides, mobilization and utilization, *Hevea brasiliensis*, 711
Glutamate
δ-aminolevulinic acid biosynthesis, RNA, algae, 497
floral induction, *Lemna paucicostata*, 904
Glutamate-1-semialdehyde, biosynthesis of δ-aminolevulinic acid, *Chlamydomonas reinhardtii*, 793
Glutathione, regulation of gelation, phloem exudate, squash and pumpkin, 1089
Glutathione peroxidase
selenium as inducer, low-carbon dioxide-grown *Chlamydomonas reinhardtii*, 649
selenium-containing macromolecules, *Thalassiosira pseudonana*, 192
Glutathione reductase, regulation of gelation, phloem exudate, squash and pumpkin, 1089
Glycine max (*see* Soybean)
Glycolate, synthesis from pyruvate via isocitrate lyase, light, tobacco leaves, 463
Glycolysis
elevated carbon dioxide concentrations, pear, 1205
enzyme binding, metabolic dependence, carrot and beet, 348
Glycophyte cells, intracellular compartmentation of ions, salt-adapted tobacco cells, 607
Glycoproteins, hydroxyproline-rich, melon callus, 540
Glycosides, cyogenic, vicianin hydrolase, squirrel's foot fern, 322
Gossypium hirsutum (*see* Cotton)
Gramineae, stable transformants, evaluation of selectable markers, 602
Grapefruit, flavedo tissue, alternative respiratory pathway, oxygen availability, 623
Grass
inhibitors of acetyl-CoA carboxylase, cyclohexanedione herbicides, 983
St. Augustine, absence of variable fluorescence, guard cell chloroplasts, 429
Gravitropism, calcium regulation, light, corn, 1276
Gravity
light-induced perception, protein phosphorylation, corn roots, 332
starch statoliths, cereal grass pulvini, 1155
Greening
phytochrome regulation
barley, 706
chlorophyll accumulation, barley, 435
pea, 299
Guard cells
protoplasts of broad bean, 700
St. Augustine grass chloroplasts, absence of variable fluorescence, 429

H

Haloxyfop, tralkoxydim and, inhibition of acetyl-CoA carboxylase, corn, 10
H^+-ATPase pump (*see also* Protons)
cytochemical localization of ATPase activity, oat roots, 841
early ethylene activation, latex, rubber tree, 899
structure, function and evolution, 1
tryptic peptides, oat plasma membrane, 512
Heat, bleaching of *Euglena gracilis*, chloroplast protein accumulation, 554
Heat shock, translational alterations in maize leaves, 1323
Heat shock proteins
cytoplasmic distribution, soybean, 1240
poly(A)$^+$ RNAs, arsenite and cadmium treatments, soybean seedlings, 1048
Helianthus annus (*see* Sunflower)
Helminthosporium carbonum, selective toxins, isolation, biological activities, 187
Herbicides
acifluorfen-methyl, mode of action, nonchlorophyllous soybean cells, 619
chloroacetanilide, rates of metabolism, corn, 359
cyclohexanedione, inhibitors of acetyl-CoA carboxylase, grasses, 983
oxyfluorfen, generation of singlet oxygen, pea, 672
resistance in *Datura innoxia*, 863
triazine resistant mutants of *Chenopodium album*, variation, transhexadecenoic acid content, 967
Hevea brasiliensis (*see* Rubber tree)
Hexachloroiridate IV, plasmalemma redox system, maize roots, 1044
Hexose, enzymes of metabolism, developing kernels, maize, 1013
Hordeum vulgare (*see* Barley)
Hormones (*see also* specific type)
action on transmembrane electron and proton transport, corn, 1038
Horseradish peroxidase, indole-3-acetic acid oxidation, crocin bleaching, 1310
HPLC, separation and indirect ultraviolet detection, phosphorylated sugars, 615
Hydrogen peroxide, metabolism in soybean embryonic axes, onset of germination, 626
Hydroxyproline-rich glycoproteins, melon callus, 540
Hygromycin, selection of transformants, gramineae, 602
Hypochlorite, influence on amylase synthesis, barley aleurone layers, 510
Hypocotyls
soybean
opposite sidedness, plasma membrane vesicles, 631
polyadenylated RNA complexity, 482

Hypoxia, corn root tips, metabolic acclimation to anoxia, 61

I

IAA (*see* Indole-3-acetic acid)
Ice (*see also* Freezing)
-encasement injury, microsomal membranes, winter wheat crowns, 740
Illumination, dark adaptation temperature, variable fluorescence and chilling, pea and cucumber, 152
Imidazolinones, herbicide resistance in *Datura innoxia*, 863
Indole-3-acetic acid
abscisic acid and, abscission zones and moisture stress, cotton, 28
changes during root formation, mung bean cuttings, 1236
indole-3-acetyl-*myo*-inositol and, translocation from kernel to shoot, corn, 79
levels in *Lemna gibba* G-3, 522
oxidation and crocin bleaching, horseradish peroxidase, 1310
oxidation to oxindole-3-acetic acid, enzyme preparation, corn, 868
purification prior to GC-SIM-MS analysis, oat, 822
Indole alkaloids, developmental regulation of biosynthesis, *Catharanthus roseus*, 447
Internodes, pea, growth and *in vivo* extensibility, tissue tension, 306
Invertases, acid and alkaline, beet, 312
Ions, intracellular compartmentation, salt-adapted tobacco cells, 607
Iron, complexation of cations, soybean xylem exudates, 734
Isocitrate lyase
glycolate synthesis from pyruvate, light, tobacco leaves, 463
regulation of gene expression, sunflower, 527
Isolectins, agglutinin of *Urtica dioica*, 598
Isoleucine, threonine and, regulation of biosynthesis, *Lemna paucicostata*, 369
Isoperoxidase, flax, elimination of mobility differences, α-mannosidase, 288

J

Jimson weed, seed, agglutinin, release upon imbibition, 569

K

Kalanchoë pinnata, sun and shade grown, internal carbon dioxide supply, photoinhibition, 117
Kanamycin, selection of transformants, gramineae, 602
Kernel
corn
development, acetolactate synthase activity, 23
enzyme activities, amyloplasts, 786
sucrose and hexose metabolism, 1013

L

Lactuca sativa (*see* Lettuce)
Latex, rubber tree, early ethylene activation, tonoplast H^+-pumping ATPase, 899
Leaf
Arabidopsis thaliana, characterization of D-enzyme, 260
barley
proline accumulation, ion fluxes and abscisic acid, 927
urease induction, 941
bean, intercellular carbon dioxide levels, 1032
Brassica chinensis, intercellular carbon dioxide levels, 1032
Carrizo citrange, split-root VA mycorrhizal symbiosis, carbon cost, 491
celery, age of, sucrose and mannitol biosynthesis, 129
corn, translational alterations, stress, 1323
cotton
intercellular carbon dioxide levels, 1032
water stress, abscisic acid movement, 908
cucumber
gas exchange, chilling effects, 143
thylakoid electron transfer, chilling effects, 147
variable fluorescence in chilling, dark adaptation temperature, 152
Eucalyptus pauciflora, intercellular carbon dioxide levels, 1032
fescue
diurnal growth, 1070, 1077
fructan content and synthesis, 1247
Norway maple, sun and shade, water allocation, 16
pea
gas exchange, chilling effects, 143
major endoamylase, partial purification, 659
thylakoid electron transfer, chilling effects, 147
variable fluorescence in chilling, dark adaptation temperature, 152
Sinapis alba, floral induction, cytokinin fluxes, 1095
Sophora japonica, lectin sequestering, protein-storage vacuoles, 1027
soybean
assimilate export, night, 517
carbon balance, assimilate export, 880
senescence, photosynthesis and chloroplasts, 108
spinach
intercellular carbon dioxide levels, 1032
regulation, acyl carrier protein mRNA levels, 1174
sugarcane, effect of apoplastic solutes, water potential, 873
sunflower, drought acclimation, osmotic adjustment, 1108
tobacco
glycolate synthesis from pyruvate, isocitrate lyase, 463
inhibited photosynthesis, manganese toxicity, 1136
tomato, chloroplast differentiation, nuclear gene expression, 7
Lectins
isolectins, *Urtica dioica* agglutinin, 598
Jimson weed agglutinin, 569
snowdrop, biosynthesis, ripening ovaries, 922
Sophora japonica bark, 67
Lemna gibba, indole-3-acetic acid levels, 522
Lemna paucicostata
floral induction, 904
regulation, threonine and isoleucine biosynthesis, 369
Lepidium sativum (*see* Cress)
Lettuce, endosperm strength and embryo growth, effect of salicylhydroxamic acid, 826
Light
activation of rubisco, stromal ATP, spinach chloroplasts, 293
agglutinability in *Chlamydomonas eugametos*, 216
blue, inhibition of stem elongation, cucumber seedling, 960
diurnal growth of tall fescue leaf blades, 1070, 1077
dual effect on seed germination, *Sisymbrium officinale*, *Arabidopsis thaliana*, 591
glycolate synthesis from pyruvate, isocitrate lyase, tobacco leaves, 463
-harvesting chlorophyll *a*/*b* protein, pea, 1120
-induced gravity perception, protein phosphorylation, corn roots, 332
-induced proton release, cyanobacterium, 769
-mediated activation of fructose-1,6-bisphosphatase, stromal free calcium concentration, spinach, 423
mitochondrial respiration, ammonium assimilation, alga, 688
-regulated petiole growth, gibberellins, pennycress, 237
regulation of gravitropism, calcium, corn, 1276
role of photosynthetic reactions, carbonic anhydrase, *Synechococcus*, 1185
Linum usitatissimum (*see* Flax)
Linustatin, mobilization and utilization, rubber tree, 711
Lipids
fat metabolism, nonphosphorylating electron transport, soybean cotyledon mitochondria, 1199
maize, germination and growth, L3 protein localization, 270
peroxidation, elicitor activity, bean, 547
receptor-mediated endocytosis, plants, 993
sugar interactions, relevance to anhydrous biology, 754
triazine resistant mutants of *Chenopodium album*, variation, transhexadecenoic acid content, 967
UDPglucose incorporation, cell wall components, intact cotton fibers, 1270
Liposomes, tonoplast vesicles and, dissipation of pH gradients, acridine orange and anions, 1315
Lotus corniculatus (*see* Birdsfoot trefoil)
Lycopersicon esculentum (*see* Tomato)
Lycopodium, sporopollenins, NMR spectroscopy, 134

M

Magnesium, mineral content, barley grains and seedlings, 93
Maize (*see* Corn)
Maltodextrins, characterization of D-enzyme, *Arabidopsis thaliana* leaf, 260
Manganese
development of toxicity
photosynthesis inhibition, tobacco, 1136
ribulosebisphosphate carboxylase/oxygenase, tobacco, 1143
Mannitol, sucrose and, biosynthesis, celery leaf age, 129
α-Mannosidase, elimination of mobility differences, flax isoperoxidase, 288
Mass spectrometry, active transport of carbon dioxide, cyanobacterium, 677
Mathematical models, phloem mobility of

xenobiotics, 803, 811
Medicago falcata (*see* Alfalfa)
Medicago sativa (*see* Alfalfa)
Membrane
alterations in protein-profile, cold treatment, alfalfa, 1005
tonoplast proton adenosine triphosphatase, pyrophosphatase, *Chara coralina*, 1168
vesicles, quantitative analysis, proton fluxes, 1257
Mesembryanthemum crystallinum, phosphoenolpyruvate carboxylase transcript levels, decline, relief from salt stress, 1002
Mesophyll cells
corn and spinach, α-glucan phosphorylases, 417
intercellular carbon dioxide levels, various plants, 1032
maize, photosystem II, plastid genome, 1020
Metal ions
induced root curvature, corn, 885
interactions with phosphoenolpyruvate carboxylase, *Crassula argentea*, corn, 104
Methionine, dual role in biosynthesis, diacylglyceryltrimethylhomoserine, *Chlamydomonas reinhardtii*, 931
Methotrexate, selection of transformants, gramineae, 602
Microsomes, ice-encasement injury to membranes, winter wheat crowns, 740
Minerals, content of barley grains and seedlings, 93
Mitochondria
proton-ATPases, structure, function and evolution, 1
respiration, germination at low pressure, mung bean, 19
respiration in light, ammonium assimilation, alga, 688
respiratory properties, air adaptation, rice seedlings, 1008
soybean cotyledon, nonphosphorylating electron transport, fat metabolism, 1199
Moisture, stress, indole-3-acetic acid and abscisic acid, cotton, 28
Monogalactosyldiacylglycerol, synthesis in spinach chloroplasts, 971
Moss, initiation and development of gametophore buds, effect of 1,4-dihydropyridines, 684
Motility, efficiency of nodulation, *Rhizobium meliloti*, 1228
Mung bean
cuttings, root formation, indole-3-acetic acid changes, 1236
galactose inhibition of auxin-induced growth, 1223
β-glucoside activators, UDP-glucose, 1099, 1104
growth and mitochondrial respiration, germination at low pressure, 19
inhibitors of acetyl-CoA carboxylase, cyclohexanedione herbicides, 983
Muskmelon, seed development and germination, water relations, 406
Myrica, time course of acetylene reduction, 581

N

NADH oxidase, auxin-stimulated, plasma membrane, soybean, 1264
Na^+/H^+ antiport, induction by sodium chloride, tonoplast vesicles, barley roots, 231
Nickel, complexation of cations, soybean xylem exudates, 734
Nicotiana plumbaginifolia (*see* Tobacco)
Nicotinana tabacum (*see* Tobacco)
Nitrate
absorption, inhibition by phenylglyoxal, corn roots, 759
ammonium nutrition and, castor bean, 914
dual effect of light, seed germination, *Sisymbrium officinale* and *Arabidopsis thaliana*, 591
kinetics of chlorate uptake, XD tobacco cells, 817
nitrite and, assimilation and action spectra, blue-green algae, 1116
transport during nitrogen deprivation, corn, 778
uptake into intact pea chloroplasts, 378, 384
Nitrogen
assimilation in cowpea nodules, 204
deprivation, nitrate transport, corn, 778
uptake in wheat seedlings, 166
Nodulation
efficiency, role of motility and chemotaxis, *Rhizobium meliloti*, 1228
sets of inducers of genes, root exudates, *Rhizobium leguminosarum*, 1298
Nodules
actinorhizal, time course of acetylene reduction, 581
cowpea
efficiency of initiation, 1121
nitrogen assimilation, 204
Glycine-Glomus-Rhizobium symbiosis, 1292
soybean, efficiency of initiation, 1210
Norway maple, chloroplasts of sun and shade leaves, water allocation, 16
Nuclear magnetic resonance spectroscopy
carbohydrate and amino acid metabolism, glucose utilization, *Sphaerosporella brunnea*, 935
roots of intact corn seedlings, 1127
sporopollenins, different plant taxa, 134

O

Oat
galactose inhibition of auxin-induced growth, 1223
plasma membrane, tryptic peptides, proton-pumping ATPase, 512
protein synthesis, dependence of stomatal closure, 341
purification of IAA, prior to GC-SIM-MS analysis, 822
root, cytochemical localization, ATPase activity, 841
Oenothera biennis, photoinduced seed germination, 475
Orange, acridine, dissipation of pH gradients, tonoplast vesicles, 1315
Ornithine decarboxylase, polyamines and pyrrolizidine alkaloids, *Senecio*, *Crotalaria*, 224
Ovaries, snowdrop, ripening, biosynthesis of lectin, 922
Oxindole-3-acetic acid, oxidation of indole-3-acetic acid, enzyme preparation, corn, 868
Oxyfluorfen, singlet oxygen generation, pea, 672
Oxygen
availability, alternative respiratory pathway, grapefruit flavedo tissue, 623
choline oxidation, spinach chloroplasts, 54
growth and mitochondrial respiration, germination at low pressure, mung bean, 19
hydrogen peroxide metabolism, germination onset, soybean embryonic axes, 626
lipid peroxidation, consequence of elicitor activity, bean, 547
loss of sensitivity, fructose-1,6-bisphosphate activity, *Flaveria linearis*, 667
singlet, generation by oxyfluorfen, pea, 672
temperature and, soybean seed coat respiration rates, 124

P

Papaver bracteatum, stimulation of sanguinarine production, fungal elicitation, hormonal deprivation, 161
Paraquat, translational alterations in maize leaves, 1323
Pavlova gyrans, chlorophyll separation, chromatography, 76
Pea
C_3 and C_4 chloroplast phosphate translocator, 1193
cell wall proteins, epicotyl growth, antibodies, 469
chilling effects
leaf gas exchange, 143
thylakoid electron transfer, 147
variable fluorescence, dark adaptation temperature, 152
chloroplast extracts, incorporation of large subunits, ribulose bisphosphate carboxylase, 44
chloroplast inner envelope vesicles, proton-linked transport, pyranine, 999
chloroplasts, nitrate uptake, 378, 384
developing fruit
export of organic materials, mechanism, 956
export of organic materials, apical senescence, 951
dihydroxyacetone phosphate reductase, 98
flash-oxidized cytochrome *f*, plastoquinone mobility, thylakoid fluidity, 355
galactose inhibition of auxin-induced growth, 1223
generation of singlet oxygen, oxyfluorfen, 672
internodes, growth and *in vivo* extensibility, tissue tension, 306
leaf, major endoamylase, partial purification, 659
light-harvesting chlorophyll *a*/*b* protein, 1120
photoperiodic and genetic control, carbon partitioning, 978
phytochrome regulation of greening, 299
root exudates, nodulation genes, *Rhizobium leguminosarum*, 1298
root hair cell walls, barriers to infection, rhizobia, 638
Pear, elevated carbon dioxide concentrations, glycolysis, 1205
Pennycress, light-regulated petiole growth,

gibberellins, 237
Pepper, abscisic acid effects, water relations and yield, transplant shock, 329
Permeability, phloem mobility of xenobiotics, 803
Persea americana (*see* Avocado)
Petunia
development, plant transformation selection system, gentamicin acetyltransferases, 1216
effects of previous pollination, stylar ethylene, pollen tube growth, 4
expression of maize storage protein gene, 1281
polyamine levels, normal and abnormal floral morphologies, 390
Petunia hybrida (*see* Petunia)
pH
apoplastic, abscisic acid movement, water-stressed cotton leaves, 908
dissipation of gradients, tonoplast vesicles and liposomes, acridine orange and anions, 1315
proton-ATPases, structure, function and evolution, 1
transmembrane electron and proton transport, hormone action, corn, 1038
Phaseolus aureus (*see* Mung bean)
Phaseolus vulgaris (*see* Bean)
Phenolic compounds, interference, 1-aminocyclopropane-1-carboxylic acid assay, avocado, 13
Phenylglyoxal, inhibition of nitrate absorption, corn roots, 759
Phloem
gelation of exudate, regulation, squash and pumpkin, 1089
mobility of xenobiotics, 803, 811
Phosphate, C_3 and C_4 chloroplast translocator, corn, 1193
Phosphoenolpyruvate-carboxykinase, role during dark anaerobiosis, *Euglena gracilis*, 457
Phosphoenolpyruvate carboxylase
activity in *Crassula argentea*, spectrophotometric assay, 325
transcript levels in *Mesembryanthemum crystallinum*, decline, relief from salt stress, 1002
Phosphofructokinases, elevated carbon dioxide concentrations, glycolysis, pear, 1205
3-Phosphoglyceric acid, photosynthetic carbon fixation, guard cell protoplasts, broad bean, 700
Phosphorus
mineral content, barley grains and seedlings, 93
net leaf accumulation, split-root VA mycorrhizal symbiosis, Carrizo citrange, 491
uptake and metabolism, aluminum effects, *Anabaena cylindrica*, 112
Phosphorylation
protein
cell wall digestion, carrot, 505
gravity signal, corn roots, 332
Photoconversion, phytochrome, measured and predicted rates, cucumber and cabbage, 749
Photoinhibition
fluorescence characteristics, sun and shade species, red algae, 946
fluorescence quenching, water-stressed *Digitalis lanata*, 246
internal carbon dioxide supply, CAM plants, 117
Photons, different flux densities, carbon balance and assimilate export, soybean, 880
Photosynthesis
activity of carbonic anhydrase, *Synechococcus*, 1185
C_4, carbonic anhydrase, 1252
carbon fixation, guard cell protoplasts, broad bean, 700
chloroplasts and, soybean leaf senescence, 108
-deficient mutants of *Chlamydomonas reinhardtii*, temperature sensitivity, 773
early inhibition, development of manganese toxicity, tobacco, 1136
enzymes, carbon dioxide assmilation, corn, 533
induction in *Alocasia macrorrhiza*, stomatal and biochemical factors, gas exchange, 782
singlet oxygen generation, oxyfluorfen, pea, 672
sun and shade grown CAM plants, internal carbon dioxide supply, photoinhibition, 117
Photosystem II, plastid genome, bundle sheath and mesophyll cells, maize, 1020
Phycobiliproteins, action spectra for nitrate and nitrite assimilation, blue-green algae, 1116
Phycobilisomes, N-terminus conservation in terminal pigment, prokaryotic and eukaryotic alga, 996
Phycomyces blakesleeanus, rotation, temperature-induced reversals, 394
Phytochrome
photoconversion, measured and predicted rates, cucumber and cabbage, 749
regulation of greening in barley, 706
regulation of greening in pea, 299
chlorophyll accumulation, 435
Phytoene, β-carotene and, stereoisomers, alga *Dunaliella bardawil*, 1286
Phytohemagglutinin, arcelin seed protein from bean, purification and characterization, 399
Pigments, chlorophyll separation, chromatography, *Pavlova gyrans*, 76
Pine, sporopollenins, NMR spectroscopy, 134
Pinus thunbergiana (*see* Pine)
Pisum sativum (*see* Pea)
Plasmalemma, redox system in maize roots, hexachloroiridate IV, electron acceptor, 1044
Plasma membrane
auxin-stimulated NADH oxidase, soybean, 1264
oat, tryptic peptides, proton-pumping ATPase, 512
protein phosphorylation, initiation of cell wall digestion, carrot, 505
receptor-mediated endocytosis, plants, 993
separation and immunological characterization, barley roots, 717
vesicles, opposite sidedness from soybean hypocotyls, 631
Plastids
bundle sheath and mesophyll cells of maize, photosystem II components, 1020
spinach, equivalence to corn, α-glucan phosphorylases, 417
Plastoquinone, mobility and thylakoid fluidity, flash-oxidized cytochrome *f*, pea, 355
Plutonium, complexation of cations, soybean xylem exudates, 734
Pollen, positive selection for male-sterile mutants, lack of adenine phosphoribosyl transferase activity, *Arabidopsis thaliana*, 1150
Pollination, previous, pollen tube growth, petunia and tobacco, 4
Polyamines
content in ripening tomato, 338
inhibitors of synthesis, resistance, putrescine in tobacco cell lines, 441
levels in petunia genotypes, normal and abnormal floral morphologies, 390
ornithine decarboxylase and pyrrolizidine alkaloids, *Senecio, Crotalaria*, 224
Polygalacturonase, *in vitro* synthesis and processing, tomato fruit, 1057
Polysomes, messenger RNA and growth in soybean stems, development, water stress, 725
Poncirus trifoliata, split-root VA mycorrhizal symbiosis, carbon cost, net leaf phosphorus accumulation, 491
Potassium
induced efflux from rose cells, 830
mineral content, barley grains and seedlings, 93
Potato
increased chorismate mutase levels, response to wounding, 895
pyrophosphate- and ATP-dependent fructose 6-phosphate 1-phosphotransferases, molecular comparison, 645
Pressure, low, germination and mitochondrial respiration, mung bean, 19
Proline, accumulation in barley leaf segments, ion fluxes, abscisic acid, 927
Protein
accumulation in chloroplast, heat bleaching, *Euglena gracilis*, 554
cell wall, pea epicotyl growth, antibodies, 469
differential two-dimensional patterns, rapeseed root system, 1304
L3, germination and growth, maize lipid bodies, 270
membrane, cold treatment, alfalfa, 1005
profiles, freezing tolerance, bromegrass, 344
-storage vacuoles, bark and leaf lectins, *Sophora japonica*, 1027
synthesis, dependence of stomatal closure, oats, 341
-synthesis inhibitors, induced potassium efflux, rose cells, 830
Protons (*see also* H^+-ATPase)
adenosine triphosphatase and pyrophosphatase, perfusion technique, *Chara corallina*, 1168
light-induced release, cyanobacterium, 769
quantitative and rapid estimation of fluxes, membrane vesicles, 1257
transport, transmembrane electrons, hormone action in corn, 1038
transport in chloroplast inner envelope vesicles, pyranine, pea and spinach, 999
uptake and release during circadian rhythmic movements, temperature ef-

fects, *Samanea* motor organs, 352
Protoplasts, guard cells of broad bean, photosynthetic carbon fixation, 700
Pulvini
cereal grass, starch statoliths as gravisensors, 1155
Samanea saman, H^+ fluxes, temperature effects, 352
Pumpkin, regulation of gelation, phloem exudate, 1089
Putrescine
polyamine content in ripening tomato, 338
utilization in tobacco cell lines, resistance, inhibitors of polyamine synthesis, 441
Pyranine, proton-linked transport, chloroplast inner envelope vesicles, pea and spinach, 999
Pyrophosphatase, tonoplast proton adenosine triphosphatase and, perfusion technique, *Chara corallina*, 1168
Pyrophosphate, ATP-dependent fructose 6-phosphate 1-phosphotransferases, molecular comparison, potato, 645
Pyrrolizidine alkaloids, ornithine decarboxylase and polyamines, *Senecio*, *Crotalaria*, 224
Pyruvate
glycolate synthesis via isocitrate lyase, light, tobacco leaves, 463
pi dikinase gene expression, wheat seed, 364
Pyruvate kinase, purification, germinating castor bean, 1064

R

Radish
primary and mature roots, arabinogalactan-proteins, 155
root hair cell walls, barriers to infection, rhizobia, 638
Raffinose, lipid-sugar interactions, relevance to anhydrous biology, 754
Ragweed, sporopollenins, NMR spectroscopy, 134
Rapeseed, differential two-dimensional protein patterns, tissue specificity, water conditions, 1304
Raphanus sativus (*see* Radish)
Respiration
air adaptations, rice seedlings, 1008
elevated carbon dioxide concentrations, glycolysis, pear, 1205
mitochondrial, germination at low pressure, mung bean, 19
rates in soybean seed coat, oxygen and temperature, 124
Rhizobia, potential barriers to infection, root hair cell walls, various plants, 638
Rhizobium japonicum, *Glycine-Glomus-Rhizobium* symbiosis, 1292
Rhizobium leguminosarum, root exudates, sets of inducers of nodulation genes, 1298
Rhizobium meliloti, efficiency of nodulation, role of motility, chemotaxis, 1228
Ribonucleic acid
biosynthesis of δ-aminolevulinic acid, glutamate, algae, 497
heat shock-specific poly(A)$^+$, arsenite and cadmium treatments, soybean seedlings, 1048
messenger
acyl carrier protein, spinach seed and leaf development, 1174
chitinase, bean, 182
isocitrate lyase gene expression, sunflower, 527
phosphoenolpyruvate carboxylase, *Mesembryanthemum crystallinum*, 1002
phytochrome regulation of greening, pea, 299
phytochrome regulation of greening, barley, 706
polysomes and growth during water deficit, soybean stems, 725
pyruvate/pi dikinase gene, wheat seed, 364
rubisco subunits, tobacco, 990
polyadenylated, complexity, soybean hypocotyl tissue, 482
Ribulose-1,5-bisphosphate carboxylase
carbon dioxide assimilation, photosynthetic enzymes, corn, 533
HPLC and indirect ultraviolet detection, phosphorylated sugars, 615
Ribulose-1,5-bisphosphate carboxylase/oxygenase
activity during development of manganese toxicity, tobacco, 1143
incorporation of large subunits, chloroplast extracts, pea, 44
localization of mRNAs, electron microscopy, tobacco, 990
missense mutation, *Chlamydomonas reinhardtii* chloroplast gene, 987
stromal ATP in chloroplasts, spinach, 293
Rice, seedling, respiration, air adaptation, 1008
Ricinus communis (*see* Castor bean)
Ripening, tomato, polyamine content, 338
RNA (*see* Ribonucleic acid)
Root
barley
membrane fractions, separation, 717
Na^+/H^+ antiport, tonoplast vesicles, 231
beet
glycolytic enzyme binding, metabolic dependence, 348
sucrose carrier, 575
carrot, glycolytic enzyme binding, metabolic dependence, 348
corn
effects of cations, hormone transport, 890
gravity signal, protein phosphorylation, 332
hexachloroiridate IV, plasmalemma redox system, 1044
hypoxia, metabolic acclimation to anoxia, 61
metal ion-induced curvature, 885
nitrate absorption, inhibition by phenylglyoxal, 759
hair cell walls, potential barriers to infection, various plants, 638
mung bean, indole-3-acetic acid changes, 1236
oat, cytochemical localization, ATPase activity, 841
pea, nodulation genes, *Rhizobium leguminosarum*, 1298
radish, arabinogalactan-proteins, 155
rapeseed, tissue-specific protein changes, 1304
Sinapis alba, floral induction, cytokinin fluxes, 1095
soybean, microsymbiont population, buoyant density, 693
Rose
induced potassium efflux, effects, protein-synthesis inhibitors, 830
whole plant carbon dioxide measurements, nondestructive estimation of growth, 355
Rubber tree
cyanogenic glycosides, mobilization and utilization, linustatin pathway, 711
latex, ethylene, tonoplast H^+-pumping ATPase, 899
RuBisCo (*see* Ribulose-1,5-bisphosphate carboxylase/oxygenase)

S

Salicylhydroxamic acid, effect on endosperm strength and embryo growth, lettuce, 826
Salt
-adapted tobacco cells, intracellular compartmentation, ions, 607
relief from stress, phosphoenolpyruvate carboxylase transcripts, *Mesembryanthemum crystallinum*, 1002
Samanea saman, pulvini, H^+ fluxes, temperature effects, 352
Sanguinarine, stimulation of production by fungal elicitation, hormonal deprivation, *Papaver bracteatum*, 161
Seed
Arabidopsis thaliana, dual effect of light, germination, 591
bean, arcelin protein, purification and characterization, 399
cocklebur, stimulation of germination, carbon dioxide and ethylene, 39
Jimson weed, agglutinin, release upon imbibition, 569
lettuce, embryo growth, effect of salicylhydroxamic acid, 826
muskmelon, development and germination, water relations, 406
Oenothera biennis, photoinduced germination, 475
petunia, expression, maize storage protein gene, 1281
Sisymbrium officinale, dual effect of light, germination, 591
soybean, seed coat respiration rates, oxygen and temperature, 124
spinach, regulation, acyl carrier protein mRNA levels, 1174
wheat, pyruvate expression, pi dikinase gene, 364
Seedling
barley, phytochrome regulation of greening, 435
cabbage, phytochrome photoconversion, 749
Catharanthus roseus, indole alkaloid biosynthesis, developmental regulation, 447
corn
L3 protein localization, lipid bodies, 270
NMR spectroscopy, roots of intact plants, 1127
cotton, defoliants, auxin transport, 241
cress, glucosinolate biosynthesis, 319
cucumber, inhibition of stem elongation by blue light, calcium, 960
mung bean, germination at low pressure, mitochondrial respiration, 19
rice, respiration, air adaptation, 1008
soybean, heat shock-specific poly(A)$^+$ RNAs, arsenite and cadmium, 1048
tomato, carbohydrate role, diurnal chilling sensitivity, 764

wheat
nitrogen uptake, 166
soil strength and water-use efficiency, carbon discrimination, 32
white spruce, chlorophyll *a* fluorescence, carbon dioxide uptake, 744
Selenium
-containing macromolecules, *Thalassiosira pseudonana*, 192
inducer of glutathione peroxidase, low-carbon dioxide-grown *Chlamydomonas reinhardtii*, 649
Senecio, ornithine decarboxylase, polyamines, pyrrolizidine alkaloids, 224
Senescence
apical
carbon partitioning, pea, 978
export of organic materials, developing pea fruit, 951
protein synthesis, dependence of stomatal closure, oats, 341
soybean leaf, photosynthesis and chloroplasts, 108
Shading, effect on soybean reproductive structures, abscisic acid content, partitioning, 71
Shoot
bromeliads, lateral growth, ethylene and cytokinins, 836
corn, indole-3-acetic acid, indole-3-acetyl-*myo*-inositol, 79
Sisymbrium officinale, dual effect of light, gibberellin- and nitrate-stimulated seed germination, 591
Snowdrop, biosynthesis of lectin, ripening ovaries, 922
Sodium
intracellular compartmentation of ions, salt-adapted tobacco cells, 607
light-induced proton release, cyanobacterium, 769
Sodium chloride, induction of Na^+/H^+ antiport, tonoplast vesicles, barley roots, 231
Soil, strength and water-use efficiency, carbon isotope discrimination, wheat seedlings, 32
Solanum melongena (*see* Eggplant)
Solubilization, reserve substances from starchy endosperm of wheat, acidification capacity, aleurone layer, 643
Solutes, apoplastic, effect on water potential, elongating sugarcane leaves, 873
Sophora japonica
bark, lectins, 67
bark and leaf lectins, sequestering, protein-storage vacuoles, 1027
Soybean
clathrin, dissociation and reassembly, 412
cotyledon mitochondria, nonphosphorylating electron transport, fat metabolism, 1199
cytoplasmic distribution, heat shock proteins, 1240
dihydroxyacetone phosphate reductase, 98
efficiency of nodule initiation, 1210
embryonic axes on onset of germination, hydrogen peroxide metabolism, 626
Glycine-Glomus-Rhizobium symbiosis, 1292
hypocotyls, opposite sidedness, plasma membrane vesicles, 631
hypocotyl tissue, polyadenylated RNA complexity, 482
leaf
assimilate export, night, 517
assimilate export, carbon balance, 880
senescence, photosynthesis and chloroplasts, 108
microsymbiont population, uniformity, buoyant density, 693
nonchlorophyllous, mode of action, acifluorfen-methyl, 619
physiological site of ethylene effects, carbon dioxide assimilation, 85
plasma membrane, auxin-stimulated NADH oxidase, 1264
polysomes and messenger RNA, growth during water deficit, 725
rapid wall relaxation in elongating tissues, 1163
root hair cell walls, barriers to infection, rhizobia, 638
seed coat respiration rates, oxygen, temperature effects, 124
seedling, heat shock-specific poly(A)$^+$ RNAs, arsenite and cadmium, 1048
shading of reproductive structures, abscisic acid content, partitioning, 71
translocation of sulfate, 798
ureide catabolism, 1084
xylem exudates, complexation of cations, 734
Sphaerosporella brunnea, glucose utilization, carbohydrate and amino acid metabolism, 935
Spinach
C_3 and C_4 chloroplast phosphate translocator, 1193
chloroplasts
choline oxidation, 54
synthesis, mono- and digalactosyldiacylglycerol, 971
dihydroxyacetone phosphate reductase, 98
equivalence to corn, α-glucan phosphorylases, 417
inhibitors of acetyl-CoA carboxylase, cyclohexanedione herbicides, 983
leaf mesophyll, intercellular carbon dioxide levels, 1032
root hair cell walls, barriers to infection, rhizobia, 638
seed and leaf development, regulation, acyl carrier protein mRNA, 1174
stromal ATP in chloroplasts, ribulose-1,5-bisphosphate carboxylase/oxygenase, 293
stromal free calcium concentration, activation, fructose-1,6-bisphosphatase, 423
transport in chloroplast inner envelope vesicles, proton-linked transport, pyranine, 999
Spinacia oleracea (*see* Spinach)
Sporangiophores, temperature-induced reversals of rotation, *Phycomyces blakesleeanus*, 394
Sporophytes, tree ferns, endogenous gibberellins, 857
Sporopollenins, different plant taxa, NMR spectroscopy, 134
Squash, regulation of gelation, phloem exudate, 1089
Squirrel's foot fern, purified vicianin hydrolase, catabolism, cyanogenic glycosides, 322
Starch
ADPglucose and, comparison, carrot, 451
corn kernel amyloplasts, enzyme activities, 786
starchless mutant of *Arabidopsis thaliana*, lack of ADPglucose pyrophosphorylase activity, 1131
statoliths as gravisensors, cereal grass pulvini, 1155
Stem
inhibition of elongation by blue light, calcium, cucumber seedling, 960
soybean
rapid wall relaxation, elongating tissues, 1163
water deficit, polysomes and mRNA, 725
Stenotaphrum secundatum (*see* Grass, St. Augustine)
Stinging nettles, agglutinin, complex mixture of isolectins, 598
Stomata
biochemical factors in photosynthetic induction, gas exchange analysis, *Alocasia macrorrhiza*, 782
dependence of closure, protein synthesis, oats, 341
responses to carbon dioxide, sunflower and cocklebur, 200
Stress, translational alterations, maize leaves, 1323
Style, effects of previous pollination, ethylene and pollen tube growth, petunia, 4
Succulents, CAM-recycling, ecophysiological significance, *Talinum calycinum*, 562
Sucrose
assimilate export at night, soybean leaves, 517
carrier, immature sugar beet tap roots, 575
enzymes of metabolism, developing kernels, maize, 1013
mannitol and, biosynthesis, celery leaf age, 129
reduced cytosolic fructose-1,6-bisphosphatase activity, loss of oxygen sensitivity, *Flaveria linearis*, 667
Sugar
lipid interactions, relevance to anhydrous biology, 754
phosphorylated, indirect ultraviolet detection, HPLC separation, 615
root hair cell walls, potential barriers to infection, various plants, 638
Sugarcane, leaves, effect of apoplastic solutes, water potential, 873
Sulfate, translocation in soybean, 798
Sulfonylurea, herbicide resistance in *Datura innoxia*, 863
Sunflower
isocitrate lyase gene expression, regulation of, 527
osmotic adjustment and chlorophyll *a* fluorescence, drought acclimation, 1108
stomatal responses to carbon dioxide, 200
Sycamore, amyloplast and chloroplast DNA, 137
Sycamore-maple, extensin monomers and oligomers, chracterization, 848
Symbiosis, uniformity of microsymbiont population, soybean nodules, buoyant density, 693
Synechococcus (*see also Anacystis nidulans*)
role of photosynthetic reactions, carbonic anhydrase, 1185

T

Talinum calycinum, CAM metabolism, CAM-recycling, ecophysiological significance, 562

Temperature
dark adaptation, variable fluorescence, chilling in pea and cucumber, 152
effects on H^+ uptake and release, circadian rhythmic movements, *Samanea* motor organs, 352
-induced reversals of rotation, *Phycomyces blakesleeanus*, 394
oxygen and, soybean seed coat respiration rates, 124
photoinduced seed germination, *Oenothera biennis*, 475
sensitivity, photosynthesis-deficient mutants, *Chlamydomonas reinhardtii*, 773
Tetrapyrroles, mode of action of acifluorfen-methyl, nonchlorophyllous soybean cells, 619
Thalassiosira pseudonana, selenium-containing macromolecules, 192
Thebaine, stimulation of sanguinarine production, *Papaver bracteatum*, 161
Thidiazuron, disruption of polar auxin transport, cotton seedlings, 241
Thlaspi arvense (*see* Pennycress)
Threonine, isoleucine and, regulation of biosynthesis, *Lemna paucicostata*, 369
Thylakoid membranes
electron transfer, chilling effects, pea and cucumber leaves, 147
fluidity and plastoquinone mobility, flash-oxidized cytochrome *f*, pea, 355
Tobacco
allyl alcohol selection, lower alcohol dehydrogenase activity, 266
development, plant transformation selection system, gentamicin acetyltransferases, 1216
development of manganese toxicity, activity, ribulosebisphosphate carboxylase/oxygenase, 1143
early inhibition of photosynthesis, development, manganese toxicity, 1136
effects of previous pollination in petunia, stylar ethylene, pollen tube growth, 4
kinetics of chlorate uptake, 817
leaf, glycolate synthesis from pyruvate, isocitrate lyase, 463
salt-adapted cells, intracellular compartmentation, ions, 607
small and large rubisco subunits, localization of mRNAs, 990
transformation with *Agrobacterium rhizogenes*, transcriptional inactivation, T_L-DNA genes, 584
utilization of putrescine, resistance, inhibitors of polyamine synthesis, 441
Tomato
chloroplast differentiation, nuclear gene expression, 7
extensin monomers and oligomers, characterization, 848
in vitro synthesis and processing, polygalacturonase, 1057
ripening, polyamine content, 338
seedling, carbohydrate role, diurnal chilling sensitivity, 764
whole plant carbon dioxide measurements, nondestructive estimation of growth, 355
Tonoplast vesicles
dissipation of pH gradients, mixtures, acridine orange and anions, 1315
induction of Na^+/H^+ antiport, sodium chloride, barley roots, 231
Toxins, isolation and biological activities, *Helminthosporium carbonum*, 187
Tralkoxydim, haloxyfop and, inhibition of acetyl-CoA carboxylase, corn, 10
Transamination, biosynthesis of δ-aminolevulinic acid, *Chlamydomonas reinhardtii*, 793
Transhexadecenoic acid, variation in content, triazine resistant mutants, *Chenopodium album*, 967
Transplant shock, antitranspirant-associated abscisic acid effects, water relations and yield, bell pepper, 329
Triticum aestivum (*see* Wheat)
Trypsin, tryptic peptides from H^+-ATPase, oat plasma membrane, 512
Turgor, rapid wall relaxation in elongating tissues, soybean, 1163

U

UDP-glucose
β-glucoside activators, mung bean, 1099, 1104
incorporation by intact cotton fibers, changes in cell wall components, chase time, 1270
Urea, nitrogen uptake, wheat seedlings, 166
Urease, induction in barley leaf, 941
Ureides, catabolism in soybeans, 1084
Urtica dioica, agglutinin, complex mixture of isolectins, 598

V

Vacuoles, protein-storage, bark and leaf lectins, *Sophora japonica*, 1027
Vesicular-arbuscular mycorrhizal fungi, split-root symbiosis, carbon cost, Carrizo citrange, 491
Vicia faba (*see* Broad bean)
Vicianin hydrolase, catabolism of cyanogenic glycosides, squirrel's foot fern, 322
Vigna angularis (*see* Azuki bean)
Vigna radiata (*see* Mung bean)
Vigna unguiculata (*see* Cowpea)

W

Water
allocation in sun and shade leaves, chloroplasts, Norway maple, 16
diurnal growth of tall fescue leaf blades, 1070
seed development and germination, muskmelon, 406
transplant shock and yield, abscisic acid, bell pepper, 329
use efficiency and soil strength, carbon isotope discrimination, wheat seedlings, 32
Water deficit, polysomes and messenger RNA, growth in soybean stems, 725
Water potential
effect of apoplastic solutes, elongating sugarcane leaves, 873
mechanism of export of organic material, developing fruits of pea, 956
Water stress
abscisic acid movement, apoplastic solution, cotton leaves, 908
abscission zones in relation to fruit retention, indole-3-acetic acid and abscisic acid, cotton, 28
fluorescence quenching, *Digitalis lanata*, 246
osmotic adjustment and chlorophyll *a* fluorescence, sunflower, 1108
white spruce seedling, chlorophyll *a* fluorescence, carbon dioxide uptake, 744
Wheat
embryos, ABA-regulation, embryo-specific sequences, 208
galactose inhibition of auxin-induced growth, 1223
inhibitors of acetyl-CoA carboxylase, cyclohexanedione herbicides, 983
root hair cell walls, barriers to infection, rhizobia, 638
seed, pyruvate expression, pi dikinase gene, 364
seedlings, nitrogen uptake, 166
soil strength and water-use efficiency, carbon isotope discrimination, 32
solubilization of reserve substances, starchy endosperm, kinetics of acidification, 643
sporopollenins, NMR spectroscopy, 134
White spruce, seedling, chlorophyll *a* fluorescence, carbon dioxide uptake, 744
Winter wheat, crowns, ice-encasement injury, microsomal membranes, 740
Wounding, increased chorismate mutase levels, potato tubers, 895

X

Xanthium pennsylvanicum (*see* Cocklebur)
Xanthium strumarium (*see* Cocklebur)
Xenobiotics, phloem mobility, 803, 811
Xylem
export of organic material, developing pea fruit, 951, 956
soybean, complexation of cations, 734

Z

Zea mays (*see* Corn)

Volume Contents

Number 1. January

REVIEW

1 **Structure, Function, and Evolution of Proton-ATPases**—Nathan Nelson

COMMUNICATIONS

4 **Effects of Previous Pollination and Stylar Ethylene on Pollen Tube Growth in *Petunia hybrida* Styles**—Folkert A. Hoekstra* and Tineke Van Roekel

7 **Transcription of Two Photosynthesis-Associated Nuclear Gene Families Correlates with the Presence of Chloroplasts in Leaves of the Variegated Tomato *ghost* Mutant**—Giovanni Giuliano and Pablo A. Scolnik*

10 **Inhibition of Acetyl-CoA Carboxylase Activity by Haloxyfop and Tralkoxydim**—Jacob Secor* and Csaba Cséke

13 **Interference of Phenolic Compounds with the 1-Aminocyclopropane-1-Carboxylic Acid Assay**—Yaron Sitrit, Joseph Riov, and Amos Blumenfeld*

16 **Water Is Allocated Differently to Chloroplasts in Sun and Shade Leaves**—Douglas C. McCain, Judith Croxdale, and John L. Markley*

19 **Growth and Mitochondrial Respiration of Mungbeans (*Phaseolus aureus* Roxb.) Germinated at Low Pressure**—Mary E. Musgrave*, Wayne A. Gerth, H. William Scheld, and Boyd R. Strain

ARTICLES

23 **Acetolactate Synthase Activity in Developing Maize (*Zea mays* L.) Kernels**—Michael J. Muhitch

28 **Changes in Free and Conjugated Indole 3-Acetic Acid and Abscisic Acid in Young Cotton Fruits and Their Abscission Zones in Relation to Fruit Retention during and after Moisture Stress**—Gene Guinn* and Donald L. Brummett

32 **Effects of Soil Strength on the Relation of Water-Use Efficiency and Growth to Carbon Isotope Discrimination in Wheat Seedlings**—Josette Masle* and Graham D. Farquhar

39 **Interrelations between Carbon Dioxide and Ethylene on the Stimulation of Cocklebur Seed Germination**—Yohji Esashi*, Kunimasa Kawabe, Kanji Isuzugawa, and Kimiharu Ishizawa

44 **Incorporation of Large Subunits into Ribulose Bisphosphate Carboxylase in Chloroplast Extracts. Influence of Added Small Subunits and of Conditions during Synthesis**—Harry Roy*, Panna Chaudhari, and Susan Cannon

50 **Stability and Dissociation of the Large Subunit RuBisCO Binding Protein Complex *in Vitro* and *in Organello***—Harry Roy*, Alan Hubbs, and Susan Cannon

54 **Choline Oxidation by Intact Spinach Chloroplasts**—Pierre Weigel, Claudia Lerma, and Andrew D. Hanson*

61 **Metabolic Acclimation to Anoxia Induced by Low (2–4 kPa Partial Pressure) Oxygen Pretreatment (Hypoxia) in Root Tips of *Zea mays***—Pierre H. Saglio, Malcolm C. Drew*, and Alain Pradet

67 **The Lectins of *Sophora japonica*. II. Purification, Properties, and N-Terminal Amino Acid Sequences of Five Lectins from Bark**—Charles N. Hankins, J. I. Kindinger, and L. M. Shannon*

71 **Effect of Shading Individual Soybean Reproductive Structures on Their Abscisic Acid Content, Metabolism, and Partitioning**—Gary L. Yarrow*, William A. Brun, and Mark L. Brenner

76 **Separation of Chlorophylls c_1 and c_2 from Pigment Extracts of *Pavlova gyrans* by Reversed-Phase High Performance Liquid Chromatography**—Marvin W. Fawley

79 **Translocation of Radiolabeled Indole-3-Acetic Acid and Indole-3-Acetyl-*myo*-Inositol from Kernel to Shoot of *Zea mays* L.**—John R. Chisnell and Robert S. Bandurski*

85 **Physiological Site of Ethylene Effects on Carbon Dioxide Assimilation in *Glycine max* L. Merr**—George E. Taylor, Jr.* and Carla A. Gunderson

93 **An Investigation of the Mineral Content of Barley Grains and Seedlings**—Ann Stewart, Hilary Nield, and John N. A. Lott*

98 **Dihydroxyacetone Phosphate Reductase in Plants**—Robert W. Gee, Richard U. Byerrum*, Dennis W. Gerber, and N. E. Tolbert

104 **Metal Ion Interactions with Phosphoenolpyruvate Carboxylase from *Crassula argentea* and *Zea mays***—Tien T. Nguyen, Apinya Ngam-ek, Joane Jenkins, and Scott D. Grover*

108 **Photosynthesis and Other Traits in Relation to Chloroplast Number during Soybean Leaf Senescence**—Duane Merlin Ford* and Richard Shibles

112 **Aluminum Effects on Uptake and Metabolism of Phosphorus by The Cyanobacterium *Anabaena cylindrica***—Annette Pettersson*, Lars Hällbom, and Birgitta Bergman

117 **Internal CO_2 Supply during Photosynthesis of Sun and Shade Grown CAM Plants in Relation to Photoinhibition**—William W. Adams III* and C. Barry Osmond

124 **Oxygen and Temperature Effects on Soybean Seed Coat Respiration Rates**—Thomas R. Sinclair

129 **Biosynthesis of Sucrose and Mannitol as a Function of Leaf Age in Celery (*Apium graveolens* L.)**—Jeanine M. Davis, John K. Fellman, and Wayne H. Loescher*

134 **High Resolution Solid State ^{13}C NMR Spectroscopy of Sporopollenins from Different Plant Taxa**—William J. Guilford*, Diane M. Schneider, Jeffrey Labovitz, and Stanley J. Opella

137 **Expression of Amyloplast and Chloroplast DNA in Suspension-Cultured Cells of Sycamore (*Acer pseudoplatanus* L.)**—Jarunya Ngernprasirtsiri, David Macherel, Hirokazu Kobayashi, and Takashi Akazawa*

143 **A Comparison of the Effects of Chilling on Leaf Gas Exchange in Pea (*Pisum sativum* L.) and Cucumber (*Cucumis sativus* L.)**—Thomas C. Peeler* and Aubrey W. Naylor

147 **A Comparison of the Effects of Chilling on Thylakoid Electron Transfer in Pea (*Pisum sativum* L.) and Cucumber (*Cucumis sativus* L.)**—Thomas C. Peeler* and Aubrey W. Naylor

152 **The Influence of Dark Adaptation Temperature on the**

* Author to whom correspondence should be addressed.

Continued on next page

Reappearance of Variable Fluorescence following Illumination—Thomas C. Peeler* and Aubrey W. Naylor

155 **Arabinogalactan-Proteins from Primary and Mature Roots of Radish (*Raphanus sativus* L.)**—Yoichi Tsumuraya*, Kiyoshi Ogura, Yohichi Hashimoto, Harutaka Mukoyama, and Shigeru Yamamoto

161 **Stimulation of Sanguinarine Production by Combined Fungal Elicitation and Hormonal Deprivation in Cell Suspension Cultures of *Papaver bracteatum***—Steven D. Cline and Carmine J. Coscia*

166 **Nitrogen Uptake by Wheat Seedlings, Interactive Effects of Four Nitrogen Sources: NO_3^-, NO_2^-, NH_4^+, and Urea**—Richard S. Criddle, Michael R. Ward, and Ray C. Huffaker*

176 **Elicitation of Diacetylenic Compounds in Suspension Cultured Cells of Eggplant**—Setsuko Imoto* and Yoshimoto Ohta

182 **Chitinase cDNA Cloning and mRNA Induction by Fungal Elicitor, Wounding, and Infection**—Susan A. Hedrick, John N. Bell, Thomas Boller, and Christopher J. Lamb*

187 **Isolation and Biological Activities of Four Selective Toxins from *Helminthosporium carbonum***—Jack B. Rasmussen and Robert P. Scheffer*

192 **Specific Selenium-Containing Macromolecules in the Marine Diatom *Thalassiosira pseudonana***—Neil M. Price* and Paul J. Harrison

200 **Do Stomata Respond to CO_2 Concentrations Other than Intercellular?**—Keith A. Mott

204 **Pathways of Nitrogen Assimilation in Cowpea Nodules Studied using $^{15}N_2$ and Allopurinol**—Craig A. Atkins*, Paul J. Storer, and John S. Pate

208 **ABA-Regulation of Two Classes of Embryo-Specific Sequences in Mature Wheat Embryos**—John D. Williamson and Ralph S. Quatrano*

216 **Light Affects Flagellar Agglutinability in *Chlamydomonas eugametos* by Modification of the Agglutinin Molecules**—Ron Kooijman*, Piet De Wildt, Wieger L. Homan, Alan Musgrave, and Herman Van den Ende

224 **Ornithine Decarboxylase, Polyamines, and Pyrrolizidine Alkaloids in *Senecio* and *Crotalaria***—Helena Birecka*, Mieczyslaw Birecki, Eric J. Cohen, Alan J. Bitonti, and Peter P. McCann

231 **NaCl Induces a Na^+/H^+ Antiport in Tonoplast Vesicles from Barley Roots**—Joan Garbarino* and Frances M. DuPont

237 **Gibberellins and Light Regulated Petiole Growth in *Thlaspi arvense* L.**—James D. Metzger

241 **Disruption of the Polar Auxin Transport System in Cotton Seedlings following Treatment with the Defoliant Thidiazuron**—Jeffrey C. Suttle

246 **Fluorescence Quenching and Gas Exchange in a Water Stressed C_3 Plant, *Digitalis lanata***—Thomas Stuhlfauth, Dieter F. Sültemeyer, Stefanie Weinz, and Heinrich P. Fock*

251 **Subcellular Localization and Characterization of Amylases in *Arabidopsis* Leaf**—Tsan-Piao Lin, Steven R. Spilatro, and Jack Preiss*

260 **Characterization of D-Enzyme (4-α-Glucanotransferase) in *Arabidopsis* Leaf**—Tsan-Piao Lin and Jack Preiss*

266 **Allyl Alcohol Selection for Lower Alcohol Dehydrogenase Activity in *Nicotiana plumbaginifolia* Cultured Cells**—Jack M. Widholm* and Isao Kishinami

270 **Immunogold Localization of the L3 Protein of Maize Lipid Bodies during Germination and Seedling Growth**—Donna E. Fernandez*, Rongda Qu, Anthony H. C. Huang, and L. Andrew Staehelin

275 **Effect of Cold Acclimation on Bulk Tissue Electrical Impedance. I. Measurements with Birdsfoot Trefoil at Subfreezing Temperatures**—Darryl G. Stout

283 **Effect of Cold Acclimation on Bulk Tissue Electrical Impedance. II. Measurements with Alfalfa and Birdsfoot Trefoil at Nonfreezing Temperatures**—Darryl G. Stout

288 **Elimination of Differences in the Mobility of Flax Isoperoxidases on PAGE by Digestion with α-Mannosidase**—Pierre-Richard Gaudreault and Hugh Tyson*

293 **Involvement of Stromal ATP in the Light Activation of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase in Intact Isolated Chloroplasts**—Simon P. Robinson and Archie R. Portis, Jr.*

299 **Phytochrome Regulation of Greening in *Pisum*. Chlorophyll Accumulation and Abundance of mRNA for the Light-Harvesting Chlorophyll *a/b* Binding Proteins**—Benjamin A. Horwitz, William F. Thompson, and Winslow R. Briggs*

306 **Growth, *in Vivo* Extensibility, and Tissue Tension in Developing Pea Internodes**—Ulrich Kutschera and Winslow R. Briggs*

312 **Acid and Alkaline Invertases in Suspension Cultures of Sugar Beet Cells**—Hiroshi Masuda*, Toshimasa Takahashi, and Shiro Sugawara

Number 2. February

COMMUNICATIONS

319 **Glucosinolate Biosynthesis. Sulfation of Desulfobenzylglucosinolate by Cell-Free Extracts of Cress (*Lepidium sativum* L.) Seedlings**—Thomas M. Glendening and Jonathan E. Poulton*

322 **Catabolism of Cyanogenic Glycosides by Purified Vicianin Hydrolase from Squirrel's Foot Fern (*Davallia trichomanoides* Blume)**—Pauline A. Lizotte and Jonathan E. Poulton*

325 **A Simple and Accurate Spectrophotometric Assay for Phosphoenolpyruvate Carboxylase Activity**—Christopher R. Meyer, Pierre Rustin, and Randolph T. Wedding*

329 **Antitranspirant Associated Abscisic Acid Effects on the Water Relations and Yield of Transplanted Bell Peppers**—Gerald A. Berkowitz* and Jack Rabin

332 **Rapid Changes in Protein Phosphorylation Associated with Light-Induced Gravity Perception in Corn Roots**—J. J. McFadden and B. W. Poovaiah*

335 **Lipid Saturation Induced Microviscosity Increase Has No Effect on the Reducibility of Flash-Oxidized Cytochrome *f* in Pea Thylakoids**—Zoltán Gombos, Klára Barabás, Ferenc Joó, and László Vigh*

338 **Polyamine Content of Long-Keeping Alcobaca Tomato Fruit**—Andrew R. G. Dibble, Peter J. Davies*, and Martha A. Mutschler

341 **The Dependence of Stomatal Closure on Protein Synthesis**—Kenneth V. Thimann* and Zhi-Yi Tan

344 **Identification of Proteins Correlated with Increased Freezing Tolerance in Bromegrass (*Bromus inermis* Leyss. cv Manchar) Cell Cultures**—Albert J. Robertson*, Lawrence V. Gusta, Martin J. T. Reaney, and Masaya Ishikawa

348 **Binding of Glycolytic Enzymes to a Particulate Fraction in Carrot and Sugar Beet Storage Roots. Dependence on Metabolic State**—Greg B. G. Moorehead and William C. Plaxton*

352 **Effects of Temperature on H^+ Uptake and Release During Circadian Rhythmic Movements of Excised *Samanea* Motor Organs**—Youngsook Lee* and Ruth L. Satter

355 **Whole Plant CO_2 Exchange Measurements for Nondestructive Estimation of Growth**—Ron G. Dutton, Jirong Jiao, M. James Tsujita, and Bernard Grodzinski*

ARTICLES

359 **Different Rates of Metabolism of Two Chloroacetanilide Herbicides in Pioneer 3320 Corn**—Keith M. O'Connell*, E. Jay Breaux, and Robert T. Fraley

364 **Cell-Specific Expression of Pyruvate, Pi Dikinase. *In Situ* mRNA Hybridization and Immunolocalization Labeling of Protein in Wheat Seed**—Kazuko Aoyagi* and Nam-Hai Chua

369 ***In Vivo* Regulation of Threonine and Isoleucine Biosynthesis in *Lemna paucicostata* Hegelm. 6746**—John Giovanelli*, S. Harvey Mudd, and Anne H. Datko

378 **Nitrate Uptake into Intact Pea Chloroplasts. I. Kinetics and Relationship with Nitrate Assimilation**—Pamela Brunswick* and Christopher E. Cresswell

384 **Nitrite Uptake into Intact Pea Chloroplasts. II. Influence of Electron Transport Regulators, Uncouplers, ATPase and Anion Uptake Inhibitors and Protein Binding Reagents**—Pamela Brunswick* and Christopher F. Cresswell

390 **Polyamine Levels in Petunia Genotypes with Normal and Abnormal Floral Morphologies**—Anton G. M. Gerats, Claudia Kaye, Cynthia Collins, and Russell L. Malmberg*

394 **Temperature-Induced Reversals of Rotation in *Phycomyces***—Matthew P. Wold and R. Igor Gamow*

399 **Purification and Characterization of Arcelin Seed Protein from Common Bean**—Thomas C. Osborn*, Mark Burow, and Fredrick A. Bliss

406 **Water Relations of Seed Development and Germination in Muskmelon (*Cucumis melo* L.). I. Water Relations of Seed and Fruit Development**—Gregory E. Welbaum* and Kent J. Bradford

412 **Dissociation and Reassembly of Soybean Clathrin**—Ruth E. Wiedenhoeft, Gregory W. Schmidt, and Barry A. Palevitz*

417 **Purification and Properties of Mesophyll and Bundle Sheath Cell α-Glucan Phosphorylases from *Zea mays* L. Equivalence of the Enzymes with the Cytosol and Plastid Phosphorylases from Spinach**—Christian Mateyka and Claus Schnarrenberger*

423 **Stromal Free Calcium Concentration and Light-Mediated Activation of Chloroplast Fructose-1,6-Bisphosphatase**—Georg Kreimer*, Michael Melkonian, Joseph A. M. Holtum, and Erwin Latzko

429 **Absence of Variable Fluorescence from Guard Cell Chloroplasts of *Stenotaphrum secundatum***—Quanning Li and Eugene A. Nothnagel*

435 **Phytochrome Regulation of Greening in Barley—Effects on Chlorophyll Accumulation**—Winslow R. Briggs*, Egon Mösinger, and Eberhard Schäfer

441 **Utilization of Putrescine in Tobacco Cell Lines Resistant to Inhibitors of Polyamine Synthesis**—Andrew Hiatt* and Russell L. Malmberg

447 **Developmental Regulation of Enzymes of Indole Alkaloid Biosynthesis in *Catharanthus roseus***—Vincenzo De Luca*, Jesus Alvarez Fernandez, Douglas Campbell, and Wolfgang G. W. Kurz

451 **Comparison of Starch and ADP-Glucose Pyrophosphorylase Levels in Nonembryogenic Cells and Developing Embryos from Induced Carrot Cultures**—Gregory L. Keller, Basil J. Nikolau, Thomas H. Ulrich, and Eve Syrkin Wurtele*

457 **Comparison of Phosphoenolpyruvate-Carboxylase from Autotrophically and Heterotrophically Grown Euglena and Its Role during Dark Anaerobiosis**—Emma Pönsgen-Schmidt, Toni Schneider, Ulrike Hammer, and Augustin Betz*

463 **Synthesis of Glycolate from Pyruvate via Isocitrate Lyase by Tobacco Leaves in Light**—Israel Zelitch

469 **Evidence Against the Involvement of Ionically Bound Cell Wall Proteins in Pea Epicotyl Growth**—Melissa A. Melan* and Daniel J. Cosgrove

475 **Photoinduced Seed Germination of *Oenothera biennis* L. III. Analysis of the Postinduction Period by Means of Temperature**—Peter A. Ensminger* and Hiroshi Ikuma

482 **Comparative Analysis of Polyadenylated RNA Complexity in Soybean Hypocotyl Tissue and Cultured Suspension Cells**—Thomas H. Ulrich* and Joe L. Key

491 **Carbon Cost of the Fungal Symbiont Relative to Net Leaf P Accumulation in a Split-Root VA Mycorrhizal Symbiosis**—David D. Douds*, Charles R. Johnson, and Karen E. Koch

497 **Characterization of the RNA Required for Biosynthesis of δ-Aminolevulinic Acid from Glutamate. Purification by Anticodon-Based Affinity Chromatography and Determination That the UUC Glutamate Anticodon Is a General Requirement for Function in ALA Biosynthesis**—Mark A. Schneegurt and Samuel I. Beale*

505 **Rapid Changes in Plasma Membrane Protein Phosphorylation during Initiation of Cell Wall Digestion**—David P. Blowers, Wendy F. Boss*, and Anthony J. Trewavas

510 **Hypochlorite Disinfection Influences the GA_3-Induced Synthesis of α-Amylase Isozymes by Isolated Barley Aleurone Layers**—Forrest T. Tittle, J. Stephen Goudey, and Mary S. Spencer*

512 **Isolation and Sequence of Tryptic Peptides from the Proton-Pumping ATPase of the Oat Plasma Membrane**—G. Eric Schaller* and Michael R. Sussman

517 **Trends in Carbohydrate Depletion, Respiratory Carbon Loss, and Assimilate Export from Soybean Leaves at Night**—Jeffrey A. Mullen and H. Ronald Koller*

522 **Levels of Indole-3-Acetic Acid in *Lemna gibba* G-3 and in a Large *Lemna* Mutant Regenerated from Tissue Culture**—Janet Pernise Slovin* and Jerry D. Cohen

527 **Regulation of Isocitrate Lyase Gene Expression in Sunflower**—Randy D. Allen*, Richard N. Trelease, and Terry L. Thomas

533 **CO_2 Assimilation and Activities of Photosynthetic Enzymes in High Chlorophyll Fluorescence Mutants of Maize Having Low Levels of Ribulose 1,5-Bisphosphate Carboxylase**—Gerald E. Edwards*, Colin L. D. Jenkins, and John Andrews

540 **Two Different Families of Hydroxyproline-Rich Glycoproteins in Melon Callus. Biochemical and Immunochemical Studies**—Dominique Mazau*, Dominique Rumeau, and Marie-Thérèse Esquerre-Tugaye

547 **Lipid Peroxidation Is a Consequence of Elicitor Activity**—Kim R. Rogers, Fred Albert, and Anne J. Anderson*

554 **Induced Changes in Chloroplast Protein Accumulation during Heat Bleaching in *Euglena gracilis***—William Ortiz* and Charles J. Wilson

562 **Ecophysiological Significance of CO_2-Recycling via Crassulacean Acid Metabolism in *Talinum calycinum* Engelm. (Portulacaceae)**—Craig E. Martin*, Michael Higley, and Wei-Zhong Wang

569 ***Datura stramonium* Agglutinin. Location in the Seed and Release upon Imbibition**—Willem F. Broekaert, Diane Lambrechts, Jean-Pierre Verbelen, and Willy J. Peumans*

575 **Evidence for the Presence of a Sucrose Carrier in Immature Sugar Beet Tap Roots**—Remi Lemoine, Jaleh Daie*, and Roger Wyse

581 **Time Course of Acetylene Reduction in Nodules of Five Actinorhizal Genera**—John D. Tjepkema*, Christa R. Schwintzer, and Christopher A. Monz

584 **Reversion of Aberrant Plants Transformed with *Agrobacterium rhizogenes* Is Associated with the Transcriptional Inactivation of the T_L-DNA Genes**—Vilas P. Sinkar, Frank F. White, Ian J. Furner, Mitchell Abrahamsen, Francois Pythoud, and Milton P. Gordon*

591 **Dual Effect of Light on the Gibberellin- and Nitrate-Stimulated Seed Germination of *Sisymbrium officinale* and *Arabidopsis thaliana***—Henk W. M. Hilhorst* and Cees M. Karssen

598 **The *Urtica dioica* Agglutinin Is a Complex Mixture of Isolectins**—Els J. M. Van Damme, Willem F. Broekaert, and Willy J. Peumans*

602 **Evaluation of Selectable Markers for Obtaining Stable Transformants in the Gramineae**—R. M. Hauptmann, V. Vasil, P. Ozias-Akins, Z. Tabaeizadeh, S. G. Rogers, R. T. Fraley, Robert B. Horsch, and Indra K. Vasil*

607 **Intracellular Compartmentation of Ions in Salt Adapted Tobacco Cells**—Marla L. Binzel*, F. Dana Hess, Ray A. Bressan, and Paul M. Hasegawa

615 **HPLC Separation and Indirect Ultraviolet Detection of Phosphorylated Sugars**—Alan V. Smrcka and Richard G. Jensen*

619 **Studies on the Mode of Action of Acifluorfen-Methyl in Nonchlorophyllous Soybean Cells. Accumulation of Tetrapyrroles**—M. Matringe* and R. Scalla

623 **Limitation of Alternative Respiratory Pathway Activity in Grapefruit Flavedo Tissue by Oxygen Availability**—Albert C. Purvis

626 **Hydrogen Peroxide Metabolism in Soybean Embryonic Axes at the Onset of Germination**—Susana Puntarulo, Rodolfo A. Sánchez, and Alberto Boveris*

631 **Plasma Membrane Vesicles of Opposite Sidedness from Soybean Hypocotyls by Preparative Free-Flow Electrophoresis**—Hervé Canut, Andrew Brightman, Alain M. Boudet, and D. James Morré*

638 **Characterization of Root Hair Cell Walls as Potential Barriers to the Infection of Plants by Rhizobia. The Carbohydrate Component**—Andrew J. Mort* and Paul B. Grover, Jr.

642 **Corrections**

Number 3. March

COMMUNICATIONS

643 **Kinetics of the Acidification Capacity of Aleurone Layer and Its Effect upon Solubilization of Reserve Substances from Starchy Endosperm of Wheat**—Alberto Hamabata, Mitla García-Maya, Teresa Romero, and Irma Bernal-Lugo*

645 **Molecular Comparison of Pyrophosphate- and ATP-Dependent Fructose 6-Phosphate 1-Phosphotransferases from Potato Tuber**—Nicholas J. Kruger* and John B. W. Hammond

649 **Selenium as Inducer of Glutathione Peroxidase in Low-CO_2-Grown *Chlamydomonas reinhardtii***—Akiho Yokota*, Shigeru Shigeoka, Toshio Onishi, and Shozaburo Kitaoka

652 **Anthocyanin Production in Chl-Rich and Chl-Poor Seedlings**—Alberto L. Mancinelli*, Ann M. Hoff, and Matthew Cottrell

655 **Chlorophyll *a* Fluorescence Yield as a Monitor of Both Active CO_2 and HCO_3^- Transport by the Cyanobacterium *Synechococcus* UTEX 625**—Anthony G. Miller*, George S. Espie, and David T. Canvin

ARTICLES

659 **Partial Purification and Characterization of the Major Endoamylase of Mature Pea Leaves**—Paul Ziegler

667 **Reduced Cytosolic Fructose-1,6-Bisphosphatase Activity Leads to Loss of O_2 Sensitivity in a *Flaveria linearis* Mutant**—Thomas D. Sharkey*, John Kobza, Jeffrey R. Seemann, and R. Harold Brown

672 **The Generation of Singlet Oxygen ($^1O_2$) by the Nitrodiphenyl Ether Herbicide Oxyfluorfen Is Independent of Photosynthesis**—Phil Haworth* and F. Dan Hess

677 **Active Transport of CO_2 by the Cyanobacterium *Synechococcus* UTEX 625. Measurement by Mass Spectrometry**—Anthony G. Miller*, George S. Espie, and David T. Canvin

684 **The Effect of 1,4-Dihydropyridines on the Initiation and Development of Gametophore Buds in the Moss *Funaria***—Patricia A. Conrad and Peter K. Hepler*

688 **Ammonium Assimilation Requires Mitochondrial Respiration in the Light. A Study with the Green Alga *Selenastrum minutum***—Harold G. Weger, Douglas G. Birch, Ivor R. Elrifi, and David H. Turpin*

693 **Uniformity of the Microsymbiont Population from Soybean Nodules with Respect to Buoyant Density**—Dale B. Karr and David W. Emerich*

700 **Photosynthetic Carbon Fixation in Guard Cell Protoplasts of *Vicia faba* L. Evidence from Radiolabel Experiments**—Kiyoshi Gotow, Scott Taylor, and Eduardo Zeiger*

706 **Phytochrome Regulation of Greening in Barley. Effects on mRNA Abundance and on Transcriptional Activity of Isolated Nuclei**—Egon Mösinger, Alfred Batschauer, Klaus Apel, Eberhard Schäfer, and Winslow R. Briggs*

711 **Mobilization and Utilization of Cyanogenic Glycosides. The Linustatin Pathway**—Dirk Selmar*, Reinhard Lieberei, and Böle Beehl

717 **Separation and Immunological Characterization of Membrane Fractions from Barley Roots**—Frances M. DuPont*, Charlene K. Tanaka, and William J. Hurkman

725 **Polysomes, Messenger RNA, and Growth in Soybean Stems during Development and Water Deficit**—Hugh S. Mason*, John E. Mullet, and John S. Boyer

734 **Organic Constituents and Complexation of Nickel(II), Iron(III), Cadmium(II), and Plutonium(IV) in Soybean Xylem Exudates**—Dominic A. Cataldo*, Kristin M. McFadden, Thomas R. Garland, and Raymond E. Wildung

740 **Ice-Encasement Injury to Microsomal Membranes Isolated from Winter Wheat Crowns. II. Changes in Membrane Lipids during Ice Encasement**—P. Richard Hetherington, Heather L. Broughton, and Bryan D. McKersie*

744 **Variable Chlorophyll *a* Fluorescence and CO_2 Uptake in Water-Stressed White Spruce Seedlings**—Peter Toivonen and William Vidaver*

749 **Phytochrome Photoconversion *in Vivo*. Comparison between Measured and Predicted Rates**—Alberto L. Mancinelli

754 **Lipid-Sugar Interactions. Relevance to Anhydrous Biology**—Martin Caffrey, Victoria Fonseca, and A. Carl Leopold*

759 **Nitrate Absorption by Corn Roots. Inhibition by Phenylglyoxal**—Kanwarpal S. Dhugga, J. Giles Waines, and Robert T. Leonard*

764 **Role of Carbohydrates in Diurnal Chilling Sensitivity of Tomato Seedlings**—Ann I. King*, Daryl C. Joyce, and Michael S. Reid

769 **Light-Induced Proton Release by the Cyanobacterium *Anabaena variabilis*. Dependence on CO_2 and Na^+**—Siegfried Scherer, Heike Riege, and Peter Böger*

773 **Temperature-Sensitive, Photosynthesis-Deficient Mutants of *Chlamydomonas reinhardtii***—Robert J. Spreitzer*, Souhail R. Al-Abed, and Michael J. Huether

778 **Exogenous $^{15}NO_3^-$ Influx and Endogenous $^{13}NO_3^-$ Efflux by Two Maize (*Zea mays* L.) Inbreds during Nitrogen Deprivation**—Robert H. Teyker*, William A. Jackson, Richard J. Volk, and Robert H. Moll

782 **Gas Exchange Analysis of the Relative Importance of Stomatal and Biochemical Factors in Photosynthetic Induction in *Alocasia macrorrhiza***—Miko U. F. Kirschbaum and Robert W. Pearcy*

786 **Enzyme Activities Associated with Maize Kernel Amyloplasts**—Edgardo Echeverria, Charles D. Boyer, Paul A. Thomas, Kang-Chien Liu, and Jack C. Shannon*

793 **Biosynthesis of δ-Aminolevulinic Acid in *Chlamydomonas reinhardtii*. Study of the Transamination Mechanism Using Specifically Labeled Glutamate**—Yun-Hwa L. Mau and Wei-Yeh Wang*

798 **Translocation of Sulfate in Soybean (*Glycine max* L. Merr)**—Ivan K. Smith* and A. Lee Lang

803 **Phloem Mobility of Xenobiotics. I. Mathematical Model Unifying the Weak Acid and Intermediate Permeability Theories**—Daniel A. Kleier

811 **Phloem Mobility of Xenobiotics. II. Bioassay Testing of the Unified Mathematical Model**—Francis C. Hsu*, Daniel A. Kleier, and Wayne R. Melander

817 **The Kinetics of Chlorate Uptake by XD Tobacco Cells**—Micha Guy*, Gracia Zabala, and Phillip Filner

822 **A Rapid and Simple Procedure for Purification of Indole-3-Acetic Acid Prior to GC-SIM-MS Analysis**—Kai-Hsien Chen, Anita N. Miller, Glenn W. Patterson, and Jerry D. Cohen*

826 **Effect of Salicylhydroxamic Acid on Endosperm Strength and Embryo Growth of *Lactuca sativa* L. cv Waldmann's Green Seeds**—Carolyn Anne Brooks and Cary Arthur Mitchell*

830 **Induced K^+ Efflux from Cultured Rose Cells. Effects of Protein-Synthesis Inhibitors**—Terence M. Murphy

836 **Role of Ethylene and Cytokinins in the Initiation of Lateral Shoot Growth in Bromeliads**—R. Van Dijck, M. De Proft*, and J. De Greef

841 **Cytochemical Localization of ATPase Activity in Oat Roots Localizes a Plasma Membrane-Associated Soluble Phosphatase, Not the Proton Pump**—Donald B. Katz*, Michael R. Sussman, Robert J. Mierzwa, and Ray F. Evert

848 **Characterization of Native and Modified Extensin Monomers and Oligomers by Electron Microscopy and Gel Filtration**—J. W. Heckman, Jr., Brian T. Terhune, and Derek T. A. Lamport*

857 **Endogenous Gibberellins from Sporophytes of Two Tree Ferns, *Cibotium glaucum* and *Dicksonia antarctica***—Hisakazu Yamane, Shozo Fujioka, Clive R. Spray, Bernard O. Phinney*, Jake MacMillan, Paul Gaskin, and Nobutaka Takahashi

863 **Herbicide Resistance in *Datura innoxia*. Cross-Resistance of Sulfonylurea-Resistant Cell Lines to Imidazolinones**—Praveen K. Saxena* and John King

868 **Oxidation of Indole-3-Acetic Acid to Oxindole-3-Acetic Acid by an Enzyme Preparation from *Zea mays***—Dennis M. Reinecke* and Robert S. Bandurski

873 **Effect of Apoplastic Solutes on Water Potential in Elongating Sugarcane Leaves**—Frederick C. Meinzer* and Paul H. Moore

880 **Daytime and Nighttime Carbon Balance and Assimilate Export in Soybean Leaves at Different Photon Flux Densities**—Jeffrey A. Mullen and H. Ronald Koller*

885 **Comparative Effectivness of Metal Ions in Inducing Curvature of Primary Roots of *Zea mays***—Karl Heinz Hasenstein*, Michael L. Evans, Charles L. Stinemetz, Randy Moore, W. Mark Fondren, E. Colin Koon, Mary A. Higby, and Alvin J. M. Smucker

890 **Effects of Cations on Hormone Transport in Primary Roots of *Zea mays***—Karl Heinz Hasenstein* and Michael L. Evans

895 **Increased Chorismate Mutase Levels as a Response to Wounding in *Solanum tuberosum* L. Tubers**—Gary Kuroki and Eric E. Conn*

899 **Early Activation by Ethylene of the Tonoplast H^+-Pumping ATPase in the Latex from *Hevea brasiliensis***—Xavier Gidrol*, Hervé Chrestin, Gilles Mounoury, and Jean D'Auzac

904 **Floral Induction in a Photoperiodically Insensitive Duckweed, *Lemna paucicostata* LP6. Role of Glutamate, Aspartate, and Other Amino Acids and Amides**—J. P. Khurana, B. K. Tamot, and S. C. Maheshwari*

908 **Abscisic Acid Movement into the Apoplastic Solution of Water-Stressed Cotton Leaves. Role of Apoplastic pH**—Wolfram Hartung, John W. Radin, and Donald L. Hendrix*

914 **Influence of Nitrate and Ammonium Nutrition on the Uptake, Assimilation, and Distribution of Nutrients in *Ricinus communis***—Marinus L. Van Beusichem*, Ernest A. Kirkby, and Robert Baas

922 **Biosynthesis of the Snowdrop (*Galanthus nivalis*) Lectin in Ripening Ovaries**—Els J. M. Van Damme* and Willy J. Peumans

927 **Ion Fluxes and Abscisic Acid-Induced Proline Accumulation in Barley Leaf Segments**—Pierantonio Pesci

931 **Dual Role of Methionine in the Biosynthesis of Diacylglyceryltrimethylhomoserine in *Chlamydomonas reinhardtii***—Naoki Sato

935 **Carbohydrate and Amino Acid Metabolism in the Ectomycorrhizal Ascomycete *Sphaerosporella brunnea* during Glucose Utilization. A ^{13}C NMR Study**—

Francis Martin*, Mauritz Ramstedt, Kenneth Söderhäll, and Daniel Canet

941 **Induction of Barley Leaf Urease**—Yuguang Chen and Te May Ching*

946 **Fluorescence Characteristics of Photoinhibition and Recovery in a Sun and a Shade Species of the Red Algal Genus *Porphyra***—Salil Bose, Stephen K. Herbert*, and David C. Fork

951 **Export of Organic Materials from Developing Fruits of Pea and Its Possible Relation to Apical Senescence**—Douglas A. Hamilton and Peter J. Davies*

956 **Mechanism of Export of Organic Material from the Developing Fruits of Pea**—Douglas A. Hamilton and Peter J. Davies*

960 **Inhibition of Stem Elongation in *Cucumis* Seedlings by Blue Light Requires Calcium**—James R. Shinkle and Russell L. Jones*

967 **Variation of Transhexadecenoic Acid Content in Two Triazine Resistant Mutants of *Chenopodium album* and Their Susceptible Progenitor**—A. Tremolieres*, H. Darmency, J. Gasquez, M. Dron, and A. Connan

971 **Synthesis of Mono- and Digalactosyldiacylglycerol in Isolated Spinach Chloroplasts**—Johan W. M. Heemskerk*, Gerard Bögemann, Johannes P. F. G. Helsper, and Jef F. G. M. Wintermans

978 **Photoperiodic and Genetic Control of Carbon Partitioning in Peas and Its Relationship to Apical Senescence**—Maureen O. Kelly* and Peter J. Davies

Number 4. April

COMMUNICATIONS

983 **Cyclohexanedione Herbicides Are Selective and Potent Inhibitors of Acetyl-CoA Carboxylase from Grasses**—Alan R. Rendina* and Judy M. Felts

987 **Missense Mutation in the *Chlamydomonas* Chloroplast Gene that Encodes the Rubisco Large Subunit**—Robert J. Spreitzer*, Tracy Brown, Zhixiang Chen, Donghong Zhang, and Souhail R. Al-Abed

990 **Localization of mRNAs for the Small and Large Subunits of Rubisco Using Electron Microscopic *in Situ* Hybridization**—Judy Brangeon*, J. L. Prioul, and A. Forchioni

993 **Receptor-Mediated Endocytosis in Plants is Energetically Possible**—Michael J. Saxton* and R. William Breidenbach

996 **N-Terminus Conservation in the Terminal Pigment of Phycobilisomes from a Prokaryotic and Eukaryotic Alga**—Elisabeth Gantt*, Francis X. Cunningham, Jr., Claudia A. Lipschultz, and Mamoru Mimuro

999 **Measurement of Proton-Linked Transport Activities in Pyranine Loaded Chloroplast Inner Envelope Vesicles**—Konrad T. Howitz and Richard E. McCarty*

1002 **PEPCase Transcript Levels in *Mesembryanthemum crystallinum* Decline Rapidly upon Relief from Salt Stress**—Daniel M. Vernon, James A. Ostrem, Juergen M. Schmitt, and Hans J. Bohnert*

1005 **Alterations in Membrane Protein-Profile during Cold Treatment of Alfalfa**—Shyam S. Mohapatra*, Ronald J. Poole, and Rajinder S. Dhindsa

ARTICLES

1008 **Respiratory Properties of Mitochondria from Rice Seedlings Germinated under Water and Their Changes during Air Adaptation**—Mineo Shibasaka* and Hideo Tsuji

1013 **Enzymes of Sucrose and Hexose Metabolism in Developing Kernels of Two Inbreds of Maize**—Douglas C. Doehlert*, Tsung Min Kuo, and Frederick C. Felker

1020 **Differential Expression in Bundle Sheath and Mesophyll Cells of Maize of Genes for Photosystem II Components Encoded by the Plastid Genome**—Jenq-Yunn Sheen and Lawrence Bogorad*

1027 **Bark and Leaf Lectins of *Sophora japonica* Are Sequestered in Protein-Storage Vacuoles**—Eliot M. Herman*, Charles N. Hankins, and Leland M. Shannon

1032 **Gradients of Intercellular CO_2 Levels Across the Leaf Mesophyll**—David F. Parkhurst*, Suan-Chin Wong, Graham D. Farquhar, and Ian R. Cowan

1038 **Hormone Action on Transmembrane Electron and H^+ Transport**—Michael Böttger* and Frank Hilgendorf

1044 **Hexachloroiridate IV as an Electron Acceptor for a Plasmalemma Redox System in Maize Roots**—Hartwig Lüthen and Michael Böttger*

1048 **Induction and Accumulation of Heat Shock-Specific Poly(A$^+$) RNAs and Proteins in Soybean Seedlings during Arsenite and Cadmium Treatments**—Leonard Edelman*, Eva Czarnecka, and Joe L. Key

1057 ***In Vitro* Synthesis and Processing of Tomato Fruit Polygalacturonase**—Dean DellaPenna and Alan B. Bennett*

1064 **Purification of Pyruvate Kinase from Germinating Castor Bean Endosperm**—William C. Plaxton

1070 **Diurnal Growth of Tall Fescue Leaf Blades. I. Spatial Distribution of Growth, Deposition of Water, and Assimilate Import in the Elongation Zone**—Hans Schnyder and Curtis J. Nelson*

1077 **Diurnal Growth of Tall Fescue Leaf Blades. II. Dry Matter Partitioning and Carbohydrate Metabolism in the Elongation Zone and Adjacent Expanded Tissue**—Hans Schnyder, Curtis J. Nelson*, and William G. Spollen

1084 **Ureide Catabolism in Soybeans. III. Ureidoglycolate Amidohydrolase and Allantoate Amidohydrolase Are Activities of an Allantoate Degrading Enzyme Complex**—Rodney G. Winkler, Dale G. Blevins*, and Douglas D. Randall

1089 **The Regulation of Gelation of Phloem Exudate from *Cucurbita* Fruit by Dilution, Glutathione, and Glutathione Reductase**—M. Carol Alosi*, Diane L. Melroy, and Roderic B. Park

1095 **Cytokinin Fluxes during Floral Induction in the Long Day Plant *Sinapis alba* L.**—Pierre Lejeune*, Jean-Marie Kinet, and Georges Bernier

1099 **β-Glucoside Activators of Mung Bean UDP-Glucose: β-Glucan Synthase. I. Identification of an Endogenous β-Linked Glucolipid Activator**—Theresa Callaghan, Peter Ross, Patricia Weinberger-Ohana, Gwenn Garden, and Moshe Benziman*

1104 **β-Glucoside Activators of Mung Bean UDP-Glucose: β-Glucan Synthase. II. Comparison of Effects of an Endogenous β-Linked Glucolipid with Synthetic *n*-Alkyl β-D-Monoglucopyranosides**—Theresa Callaghan, Peter Ross, Patricia Weinberger-Ohana, and Moshe Benziman*

1108 **Influence of Drought Acclimation and CO_2 Enrichment on Osmotic Adjustment and Chlorophyll *a* Fluorescence of Sunflower during Drought**—Jann P. Conroy*, James M. Virgona, Robert M. Smillie, and Edward W. Barlow

1116 **Action Spectra for Nitrate and Nitrite Assimilation in Blue-Green Algae**—Aurelio Serrano* and Manuel Losada

1120 **Light-Harvesting Chlorophyll *a/b* Protein. Membrane Insertion, Proteolytic Processing, Assembly into LHC II, and Localization to Appressed Membranes Occurs in Chloroplast Lysates**—Kenneth Cline

1127 **^{31}P-NMR Spectroscopy of Roots of Intact Corn Seedlings**—Justin K. M. Roberts* and M. Pia Testa

1131 **Isolation and Characterization of a Starchless Mutant of *Arabidopsis thaliana* (L.) Heynh Lacking ADPglucose Pyrophosphorylase Activity**—Tsan-Piao Lin, Timothy Caspar, Chris Somerville, and Jack Preiss*

1136 **Early Inhibition of Photosynthesis during Development of Mn Toxicity in Tobacco**—Ross O. Nable, Robert L. Houtz, and George M. Cheniae

1143 **Evidence for Effects on the *in Vivo* Activity of Ribulose-Bisphosphate Carboxylase/Oxygenase during Development of Mn Toxicity in Tobacco**—Robert L. Houtz, Ross O. Nable, and George M. Cheniae*

1150 **Positive Selection for Male-Sterile Mutants of *Arabidopsis* Lacking Adenine Phosphoribosyl Transferase Activity**—Barbara Moffatt and Chris Somerville*

1155 **Do Starch Statoliths Act as the Gravisensors in Cereal Grass Pulvini?**—Il Song, Casey R. Lu, Thomas G. Brock, and Peter B. Kaufman*

1163 **Rapid Wall Relaxation in Elongating Tissues**—Rainer Matyssek, Sachio Maruyama, and John S. Boyer*

1168 **Characterization of the H^+ Translocating Adenosine Triphosphatase and Pyrophosphatase of Vacuolar Membranes Isolated by Means of a Perfusion Technique from *Chara corallina***—Kazuhiko Takeshige*, Masashi Tazawa, and Achim Hager

1174 **Regulation of Acyl Carrier Protein Messenger RNA Levels during Seed and Leaf Development**—David J. Hannapel and John B. Ohlrogge*

1179 **Identification and Purification of a Derepressible Alkaline Phosphatase from *Anacystis nidulans* R2**—Maryse A. Block* and Arthur R. Grossman

1185 **Role of Photosynthetic Reactions in the Activity of Carbonic Anhydrase in *Synechococcus* sp. (UTEX 2380) in the Light. Inhibitor Studies Using the ^{18}O-Exchange in $^{13}C/^{18}O$-Labeled Bicarbonate**—Hart Spiller*, George Clifford Wynns, and Chingkuang Tu

1193 **Specific Labeling of the Phosphate Translocator in C_3 and C_4 Mesophyll Chloroplasts by Tritiated Dihydro-DIDS (1,2-Ditritio-1,2-[2,2′-Disulfo-4,4′-Diisothiocyano] Diphenylethane)**—Mary E. Rumpho*, Gerald E. Edwards, Abdullah E. Yousif, and Kenneth Keegstra

1199 **Regulation of Nonphosphorylating Electron Transport Pathways in Soybean Cotyledon Mitochondria and Its Implications for Fat Metabolism**—David A. Day*, Anthony L. Moore, Ian B. Dry, Joseph T. Wiskich, and Joaquin Azcon-Bieto

1205 **Effects of Elevated CO_2 Concentrations on Glycolysis in Intact 'Bartlett' Pear Fruit**—Eduardo L. Kerbel*, Adel A. Kader, and Roger J. Romani

1210 **Efficiency of Nodule Initiation in Cowpea and Soybean**—T. V. Bhuvaneswari, Andrew P. Lesniak, and Wolfgang D. Bauer*

1216 **Development of a Plant Transformation Selection System Based on Expression of Genes Encoding Gentamicin Acetyltransferases**—Maria B. Hayford, June I. Medford, Nancy L. Hoffman, Stephen G. Rogers, and Harry J. Klee*

1223 **Galactose Inhibition of Auxin-Induced Growth of Mono- and Dicotyledonous Plants**—Ryoichi Yamamoto*, Masahiro Inouhe, and Yosiho Masuda

1228 **Role of Motility and Chemotaxis in Efficiency of Nodulation by *Rhizobium meliloti***—Gustavo Caetano-Anollés*, Luis G. Wall, Ana T. De Micheli, Edgardo M. Macchi, Wolfgang D. Bauer, and Gabriel Favelukes

1236 **Changes in the Level of [^{14}C]Indole-3-Acetic Acid and [^{14}C]Indoleacetylaspartic Acid during Root Formation in Mung Bean Cuttings**—Jeffrey G. Norcini and Charles W. Heuser*

1240 **Cytoplasmic Distribution of Heat Shock Proteins in Soybean**—Michael A. Mansfield* and Joe L. Key

1247 **Fructan Content and Synthesis in Leaf Tissues of *Festuca arundinacea***—Thomas L. Housley* and Jeffrey J. Volenec

1252 **Low Bundle Sheath Carbonic Anhydrase Is Apparently Essential for Effective C_4 Pathway Operation**—James N. Burnell and Marshall D. Hatch*

1257 **Quantitative and Rapid Estimation of H^+ Fluxes in Membrane Vesicles. Software for Analysis of Fluorescence Quenching and Relaxation**—Ian R. Jennings, Philip A. Rea, Roger A. Leigh, and Dale Sanders*

1264 **Auxin-Stimulated NADH Oxidase Purified from Plasma Membrane of Soybean**—Andrew O. Brightman, Rita Barr, Frederick L. Crane, and D. James Morré*

1270 **Changes in the ^{14}C-Labeled Cell Wall Components with Chase Time after Incorporation of UDP[^{14}C]Glucose by Intact Cotton Fibers**—W. M. Dugger* and Raymond L. Palmer

1276 **Calcium in the Regulation of Gravitropism by Light**—Donna O. Perdue*, Adrienne K. LaFavre, and A. Carl Leopold

1281 **Expression of a Maize Storage Protein Gene in Petunia Plants Is Not Restricted to Seeds**—Peter Ueng, Gad Galili, Victoria Sapanara, Peter B. Goldsbrough, Phillip Dube, Roger N. Beachy, and Brian A. Larkins*

1286 **Stereoisomers of β-Carotene and Phytoene in the Alga *Dunaliella bardawil***—Ami Ben-Amotz*, Amnon Lers, and Mordhay Avron

1292 **The *Glycine-Glomus-Rhizobium* Symbiosis. VII. Photosynthetic Nutrient-Use Efficiency in Nodulated, Mycorrhizal Soybeans**—Milford S. Brown and Gabor J. Bethlenfalvay*

1298 **Root Exudates of Various Host Plants of *Rhizobium leguminosarum* Contain Different Sets of Inducers of *Rhizobium* Nodulation Genes**—Sebastian A. J. Zaat*, Carel A. Wijffelman, Ine H. M. Mulders, Anton A. N. van Brussel, and Ben J. J. Lugtenberg

1304 **Differential Two-Dimensional Protein Patterns as Related to Tissue Specificity and Water Conditions in *Brassica napus* var *oleifera* Root System**—Catherine Damerval, Nicole Vartanian*, and Dominique de Vienne

1310 **Indole-3-Acetic Acid Oxidation and Crocin Bleaching by Horseradish Peroxidase**—Wolfgang F. Osswald*, Wolfgang Schütz, and Erich F. Elstner

1315 **Dissipation of pH Gradients in Tonoplast Vesicles and Liposomes by Mixtures of Acridine Orange and Anions. Implications for the Use of Acridine Orange as a pH Probe**—Andrew J. Pope* and Roger A. Leigh

1323 **Translational Alterations in Maize Leaves Responding to Pathogen Infection, Paraquat Treatment, or Heat Shock. Polysome Dissociation and Accumulation of a 57 Kilodalton Protein**—Cathy H. Wu, Herman L. Warren, Kalavathy Sitaraman, and Charles Y. Tsai*

1330 **Corrections**

Volume Contents by Subject

METABOLISM AND ENZYMOLOGY

10 **Inhibition of Acetyl-CoA Carboxylase Activity by Haloxyfop and Tralkoxydim**—Jacob Secor* and Csaba Cséke

23 **Acetolactate Synthase Activity in Developing Maize (*Zea mays* L.) Kernels**—Michael J. Muhitch

54 **Choline Oxidation by Intact Spinach Chloroplasts**—Pierre Weigel, Claudia Lerma, and Andrew D. Hanson*

98 **Dihydroxyacetone Phosphate Reductase in Plants**—Robert W. Gee, Richard U. Byerrum*, Dennis W. Gerber, and N. E. Tolbert

104 **Metal Ion Interactions with Phosphoenolpyruvate Carboxylase from *Crassula argentea* and *Zea mays***—Tien T. Nguyen, Apinya Ngam-ek, Joane Jenkins, and Scott D. Grover*

129 **Biosynthesis of Sucrose and Mannitol as a Function of Leaf Age in Celery (*Apium graveolens* L.)**—Jeanine M. Davis, John K. Fellman, and Wayne H. Loescher*

161 **Stimulation of Sanguinarine Production by Combined Fungal Elicitation and Hormonal Deprivation in Cell Suspension Cultures of *Papaver bracteatum***—Steven D. Cline and Carmine J. Coscia*

166 **Nitrogen Uptake by Wheat Seedlings, Interactive Effects of Four Nitrogen Sources: NO_3^-, NO_2^-, NH_4^+, and Urea**—Richard S. Criddle, Michael R. Ward, and Ray C. Huffaker*

176 **Elicitation of Diacetylenic Compounds in Suspension Cultured Cells of Eggplant**—Setsuko Imoto* and Yoshimoto Ohta

192 **Specific Selenium-Containing Macromolecules in the Marine Diatom *Thalassiosira pseudonana***—Neil M. Price* and Paul J. Harrison

204 **Pathways of Nitrogen Assimilation in Cowpea Nodules Studied using $^{15}N_2$ and Allopurinol**—Craig A. Atkins*, Paul J. Storer, and John S. Pate

224 **Ornithine Decarboxylase, Polyamines, and Pyrrolizidine Alkaloids in *Senecio* and *Crotalaria***—Helena Birecka*, Mieczyslaw Birecki, Eric J. Cohen, Alan J. Bitonti, and Peter P. McCann

251 **Subcellular Localization and Characterization of Amylases in *Arabidopsis* Leaf**—Tsan-Piao Lin, Steven R. Spilatro, and Jack Preiss*

260 **Characterization of D-Enzyme (4-α-Glucanotransferase) in *Arabidopsis* Leaf**—Tsan-Piao Lin and Jack Preiss*

266 **Allyl Alcohol Selection for Lower Alcohol Dehydrogenase Activity in *Nicotiana plumbaginifolia* Cultured Cells**—Jack M. Widholm* and Isao Kishinami

293 **Involvement of Stromal ATP in the Light Activation of Ribulose-1,5-Bisphosphate Carboxylase/Oxygenase in Intact Isolated Chloroplasts**—Simon P. Robinson and Archie R. Portis, Jr.*

312 **Acid and Alkaline Invertases in Suspension Cultures of Sugar Beet Cells**—Hiroshi Masuda*, Toshimasa Takahashi, and Shiro Sugawara

319 **Glucosinolate Biosynthesis. Sulfation of Desulfobenzylglucosinolate by Cell-Free Extracts of Cress (*Lepidium sativum* L.) Seedlings**—Thomas M. Glendening and Jonathan E. Poulton*

322 **Catabolism of Cyanogenic Glycosides by Purified Vicianin Hydrolase from Squirrel's Foot Fern (*Davallia trichomanoides* Blume)**—Pauline A. Lizotte and Jonathan E. Poulton*

325 **A Simple and Accurate Spectrophotometric Assay for Phosphoenolpyruvate Carboxylase Activity**—Christopher R. Meyer, Pierre Rustin, and Randolph T. Wedding*

348 **Binding of Glycolytic Enzymes to a Particulate Fraction in Carrot and Sugar Beet Storage Roots. Dependence on Metabolic State**—Greg B. G. Moorehead and William C. Plaxton*

359 **Different Rates of Metabolism of Two Chloroacetanilide Herbicides in Pioneer 3320 Corn**—Keith M. O'Connell*, E. Jay Breaux, and Robert T. Fraley

369 ***In Vivo* Regulation of Threonine and Isoleucine Biosynthesis in *Lemna paucicostata* Hegelm. 6746**—John Giovanelli*, S. Harvey Mudd, and Anne H. Datko

378 **Nitrate Uptake into Intact Pea Chloroplasts. I. Kinetics and Relationship with Nitrate Assimilation**—Pamela Brunswick* and Christopher E. Cresswell

384 **Nitrite Uptake into Intact Pea Chloroplasts. II. Influence of Electron Transport Regulators, Uncouplers, ATPase and Anion Uptake Inhibitors and Protein Binding Reagents**—Pamela Brunswick* and Christopher F. Cresswell

417 **Purification and Properties of Mesophyll and Bundle Sheath Cell α-Glucan Phosphorylases from *Zea mays* L. Equivalence of the Enzymes with the Cytosol and Plastid Phosphorylases from Spinach**—Christian Mateyka and Claus Schnarrenberger*

423 **Stromal Free Calcium Concentration and Light-Mediated Activation of Chloroplast Fructose-1,6-Bisphosphatase**—Georg Kreimer*, Michael Melkonian, Joseph A. M. Holtum, and Erwin Latzko

441 **Utilization of Putrescine in Tobacco Cell Lines Resistant to Inhibitors of Polyamine Synthesis**—Andrew Hiatt* and Russell L. Malmberg

447 **Developmental Regulation of Enzymes of Indole Alkaloid Biosynthesis in *Catharanthus roseus***—Vincenzo De Luca*, Jesus Alvarez Fernandez, Douglas Campbell, and Wolfgang G. W. Kurz

457 **Comparison of Phosphoenolpyruvate-Carboxylase from Autotrophically and Heterotrophically Grown Euglena and Its Role during Dark Anaerobiosis**—Emma Pönsgen-Schmidt, Toni Schneider, Ulrike Hammer, and Augustin Betz*

463 **Synthesis of Glycolate from Pyruvate via Isocitrate Lyase by Tobacco Leaves in Light**—Israel Zelitch

497 **Characterization of the RNA Required for Biosynthesis of δ-Aminolevulinic Acid from Glutamate. Purification by Anticodon-Based Affinity Chromatography and Determination That the UUC Glutamate Anticodon Is a General Requirement for Function in ALA Biosynthesis**—Mark A. Schneegurt and Samuel I. Beale*

510 **Hypochlorite Disinfection Influences the GA_3-Induced Synthesis of α-Amylase Isozymes by Isolated Barley Aleurone Layers**—Forrest T. Tittle, J. Stephen Goudey, and Mary S. Spencer*

517 **Trends in Carbohydrate Depletion, Respiratory Carbon Loss, and Assimilate Export from Soybean Leaves at Night**—Jeffrey A. Mullen and H. Ronald Koller*

533 **CO_2 Assimilation and Activities of Photosynthetic Enzymes in High Chlorophyll Fluorescence Mutants of Maize Having Low Levels of Ribulose 1,5-Bis-**

* Author to whom correspondence should be addressed.

Continued from preceding page

phosphate Carboxylase—Gerald E. Edwards*, Colin L. D. Jenkins, and John Andrews

615 **HPLC Separation and Indirect Ultraviolet Detection of Phosphorylated Sugars**—Alan V. Smrcka and Richard G. Jensen*

645 **Molecular Comparison of Pyrophosphate- and ATP-Dependent Fructose 6-Phosphate 1-Phosphotransferases from Potato Tuber**—Nicholas J. Kruger* and John B. W. Hammond

659 **Partial Purification and Characterization of the Major Endoamylase of Mature Pea Leaves**—Paul Ziegler

667 **Reduced Cytosolic Fructose-1,6-Bisphosphatase Activity Leads to Loss of O_2 Sensitivity in a *Flaveria linearis* Mutant**—Thomas D. Sharkey*, John Kobza, Jeffrey R. Seemann, and R. Harold Brown

688 **Ammonium Assimilation Requires Mitochondrial Respiration in the Light. A Study with the Green Alga *Selenastrum minutum***—Harold G. Weger, Douglas G. Birch, Ivor R. Elrifi, and David H. Turpin*

700 **Photosynthetic Carbon Fixation in Guard Cell Protoplasts of *Vicia faba* L. Evidence from Radiolabel Experiments**—Kiyoshi Gotow, Scott Taylor, and Eduardo Zeiger*

711 **Mobilization and Utilization of Cyanogenic Glycosides. The Linustatin Pathway**—Dirk Selmar*, Reinhard Lieberei, and Böle Beehl

773 **Temperature-Sensitive, Photosynthesis-Deficient Mutants of *Chlamydomonas reinhardtii***—Robert J. Spreitzer*, Souhail R. Al-Abed, and Michael J. Huether

786 **Enzyme Activities Associated with Maize Kernel Amyloplasts**—Edgardo Echeverria, Charles D. Boyer, Paul A. Thomas, Kang-Chien Liu, and Jack C. Shannon*

793 **Biosynthesis of δ-Aminolevulinic Acid in *Chlamydomonas reinhardtii*. Study of the Transamination Mechanism Using Specifically Labeled Glutamate**—Yun-Hwa L. Mau and Wei-Yeh Wang*

798 **Translocation of Sulfate in Soybean (*Glycine max* L. Merr)**—Ivan K. Smith* and A. Lee Lang

868 **Oxidation of Indole-3-Acetic Acid to Oxindole-3-Acetic Acid by an Enzyme Preparation from *Zea mays***—Dennis M. Reinecke* and Robert S. Bandurski

895 **Increased Chorismate Mutase Levels as a Response to Wounding in *Solanum tuberosum* L. Tubers**—Gary Kuroki and Eric E. Conn*

922 **Biosynthesis of the Snowdrop (*Galanthus nivalis*) Lectin in Ripening Ovaries**—Els J. M. Van Damme* and Willy J. Peumans

931 **Dual Role of Methionine in the Biosynthesis of Diacylglyceryltrimethylhomoserine in *Chlamydomonas reinhardtii***—Naoki Sato

935 **Carbohydrate and Amino Acid Metabolism in the Ectomycorrhizal Ascomycete *Sphaerosporella brunnea* during Glucose Utilization. A ^{13}C NMR Study**—Francis Martin*, Mauritz Ramstedt, Kenneth Söderhäll, and Daniel Canet

941 **Induction of Barley Leaf Urease**—Yuguang Chen and Te May Ching*

971 **Synthesis of Mono- and Digalactosyldiacylglycerol in Isolated Spinach Chloroplasts**—Johan W. M. Heemskerk*, Gerard Bögemann, Johannes P. F. G. Helsper, and Jef F. G. M. Wintermans

983 **Cyclohexanedione Herbicides Are Selective and Potent Inhibitors of Acetyl-CoA Carboxylase from Grasses**—Alan R. Rendina* and Judy M. Felts

1008 **Respiratory Properties of Mitochondria from Rice Seedlings Germinated under Water and Their Changes during Air Adaptation**—Mineo Shibasaka* and Hideo Tsuji

1013 **Enzymes of Sucrose and Hexose Metabolism in Developing Kernels of Two Inbreds of Maize**—Douglas C. Doehlert*, Tsung Min Kuo, and Frederick C. Felker

1064 **Purification of Pyruvate Kinase from Germinating Castor Bean Endosperm**—William C. Plaxton

1084 **Ureide Catabolism in Soybeans. III. Ureidoglycolate Amidohydrolase and Allantoate Amidohydrolase Are Activities of an Allantoate Degrading Enzyme Complex**—Rodney G. Winkler, Dale G. Blevins*, and Douglas D. Randall

1089 **The Regulation of Gelation of Phloem Exudate from *Cucurbita* Fruit by Dilution, Glutathione, and Glutathione Reductase**—M. Carol Alosi*, Diane L. Melroy, and Roderic B. Park

1099 **β-Glucoside Activators of Mung Bean UDP-Glucose: β-Glucan Synthase. I. Identification of an Endogenous β-Linked Glucolipid Activator**—Theresa Callaghan, Peter Ross, Patricia Weinberger-Ohana, Gwenn Garden, and Moshe Benziman*

1104 **β-Glucoside Activators of Mung Bean UDP-Glucose: β-Glucan Synthase. II. Comparison of Effects of an Endogenous β-Linked Glucolipid with Synthetic *n*-Alkyl β-D-Monoglucopyranosides**—Theresa Callaghan, Peter Ross, Patricia Weinberger-Ohana, and Moshe Benziman*

1116 **Action Spectra for Nitrate and Nitrite Assimilation in Blue-Green Algae**—Aurelio Serrano* and Manuel Losada

1127 **^{31}P-NMR Spectroscopy of Roots of Intact Corn Seedlings**—Justin K. M. Roberts* and M. Pia Testa

1185 **Role of Photosynthetic Reactions in the Activity of Carbonic Anhydrase in *Synechococcus* sp. (UTEX 2380) in the Light. Inhibitor Studies Using the ^{18}O-Exchange in $^{13}C/^{18}O$-Labeled Bicarbonate**—Hart Spiller*, George Clifford Wynns, and Chingkuang Tu

1193 **Specific Labeling of the Phosphate Translocator in C_3 and C_4 Mesophyll Chloroplasts by Tritiated Dihydro-DIDS (1,2-Ditritio-1,2-[2,2′-Disulfo-4,4′-Diisothiocyano] Diphenylethane)**—Mary E. Rumpho*, Gerald E. Edwards, Abdullah E. Yousif, and Kenneth Keegstra

1199 **Regulation of Nonphosphorylating Electron Transport Pathways in Soybean Cotyledon Mitochondria and Its Implications for Fat Metabolism**—David A. Day*, Anthony L. Moore, Ian B. Dry, Joseph T. Wiskich, and Joaquin Azcon-Bieto

1205 **Effects of Elevated CO_2 Concentrations on Glycolysis in Intact 'Bartlett' Pear Fruit**—Eduardo L. Kerbel*, Adel A. Kader, and Roger J. Romani

1247 **Fructan Content and Synthesis in Leaf Tissues of *Festuca arundinacea***—Thomas L. Housley* and Jeffrey J. Volenec

1252 **Low Bundle Sheath Carbonic Anhydrase Is Apparently Essential for Effective C_4 Pathway Operation**—James N. Burnell and Marshall D. Hatch*

1286 **Stereoisomers of β-Carotene and Phytoene in the Alga *Dunaliella bardawil***—Ami Ben-Amotz*, Amnon Lers, and Mordhay Avron

1310 **Indole-3-Acetic Acid Oxidation and Crocin Bleaching by Horseradish Peroxidase**—Wolfgang F. Osswald*, Wolfgang Schütz, and Erich F. Elstner

MOLECULAR BIOLOGY AND GENE REGULATION

7 **Transcription of Two Photosynthesis-Associated Nuclear Gene Families Correlates with the Presence of Chloroplasts in Leaves of the Variegated Tomato *ghost* Mutant**—Giovanni Giuliano and Pablo A. Scolnik*

44 **Incorporation of Large Subunits into Ribulose Bisphosphate Carboxylase in Chloroplast Extracts. Influence of Added Small Subunits and of Conditions during Synthesis**—Harry Roy*, Panna Chaudhari, and Susan Cannon

50 **Stability and Dissociation of the Large Subunit RuBisCO Binding Protein Complex *in Vitro* and *in Organello***—Harry Roy*, Alan Hubbs, and Susan Cannon

137 **Expression of Amyloplast and Chloroplast DNA in Suspension-Cultured Cells of Sycamore (*Acer pseudoplatanus* L.)**—Jarunya Ngernprasirtsiri, David Macherel, Hirokazu Kobayashi, and Takashi Akazawa*

208 **ABA-Regulation of Two Classes of Embryo-Specific Sequences in Mature Wheat Embryos**—John D. Williamson and Ralph S. Quatrano*

299 **Phytochrome Regulation of Greening in *Pisum*. Chlorophyll Accumulation and Abundance of mRNA for the Light-Harvesting Chlorophyll *a/b* Binding Proteins**—Benjamin A. Horwitz, William F. Thompson, and Winslow R. Briggs*

344 **Identification of Proteins Correlated with Increased Freezing Tolerance in Bromegrass (*Bromus inermis* Leyss. cv Manchar) Cell Cultures**—Albert J. Robertson*, Lawrence V. Gusta, Martin J. T. Reaney, and Masaya Ishikawa

364 **Cell-Specific Expression of Pyruvate, Pi Dikinase. *In Situ* mRNA Hybridization and Immunolocalization Labeling of Protein in Wheat Seed**—Kazuko Aoyagi* and Nam-Hai Chua

482 **Comparative Analysis of Polyadenylated RNA Complexity in Soybean Hypocotyl Tissue and Cultured Suspension Cells**—Thomas H. Ulrich* and Joe L. Key

527 **Regulation of Isocitrate Lyase Gene Expression in Sunflower**—Randy D. Allen*, Richard N. Trelease, and Terry L. Thomas

584 **Reversion of Aberrant Plants Transformed with *Agrobacterium rhizogenes* Is Associated with the Transcriptional Inactivation of the T_L-DNA Genes**—Vilas P. Sinkar, Frank F. White, Ian J. Furner, Mitchell Abrahamsen, Francois Pythoud, and Milton P. Gordon*

602 **Evaluation of Selectable Markers for Obtaining Stable Transformants in the Gramineae**—R. M. Hauptmann, V. Vasil, P. Ozias-Akins, Z. Tabaeizadeh, S. G. Rogers, R. T. Fraley, Robert B. Horsch, and Indra K. Vasil*

706 **Phytochrome Regulation of Greening in Barley. Effects on mRNA Abundance and on Transcriptional Activity of Isolated Nuclei**—Egon Mösinger, Alfred Batschauer, Klaus Apel, Eberhard Schäfer, and Winslow R. Briggs*

987 **Missense Mutation in the *Chlamydomonas* Chloroplast Gene that Encodes the Rubisco Large Subunit**—Robert J. Spreitzer*, Tracy Brown, Zhixiang Chen, Donghong Zhang, and Souhail R. Al-Abed

1002 **PEPCase Transcript Levels in *Mesembryanthemum crystallinum* Decline Rapidly upon Relief from Salt Stress**—Daniel M. Vernon, James A. Ostrem, Juergen M. Schmitt, and Hans J. Bohnert*

1020 **Differential Expression in Bundle Sheath and Mesophyll Cells of Maize of Genes for Photosystem II Components Encoded by the Plastid Genome**—Jenq-Yunn Sheen and Lawrence Bogorad*

1048 **Induction and Accumulation of Heat Shock-Specific Poly(A^+) RNAs and Proteins in Soybean Seedlings during Arsenite and Cadmium Treatments**—Leonard Edelman*, Eva Czarnecka, and Joe L. Key

1131 **Isolation and Characterization of a Starchless Mutant of *Arabidopsis thaliana* (L.) Heynh Lacking ADPglucose Pyrophosphorylase Activity**—Tsan-Piao Lin, Timothy Caspar, Chris Somerville, and Jack Preiss*

1174 **Regulation of Acyl Carrier Protein Messenger RNA Levels during Seed and Leaf Development**—David J. Hannapel and John B. Ohlrogge*

1216 **Development of a Plant Transformation Selection System Based on Expression of Genes Encoding Gentamicin Acetyltransferases**—Maria B. Hayford, June I. Medford, Nancy L. Hoffman, Stephen G. Rogers, and Harry J. Klee*

1281 **Expression of a Maize Storage Protein Gene in Petunia Plants Is Not Restricted to Seeds**—Peter Ueng, Gad Galili, Victoria Sapanara, Peter B. Goldsbrough, Phillip Dube, Roger N. Beachy, and Brian A. Larkins*

ENVIRONMENTAL AND STRESS PHYSIOLOGY

4 **Effects of Previous Pollination and Stylar Ethylene on Pollen Tube Growth in *Petunia hybrida* Styles**—Folkert A. Hoekstra* and Tineke Van Roekel

16 **Water Is Allocated Differently to Chloroplasts in Sun and Shade Leaves**—Douglas C. McCain, Judith Croxdale, and John L. Markley*

19 **Growth and Mitochondrial Respiration of Mungbeans (*Phaseolus aureus* Roxb.) Germinated at Low Pressure**—Mary E. Musgrave*, Wayne A. Gerth, H. William Scheld, and Boyd R. Strain

28 **Changes in Free and Conjugated Indole 3-Acetic Acid and Abscisic Acid in Young Cotton Fruits and Their Abscission Zones in Relation to Fruit Retention during and after Moisture Stress**—Gene Guinn* and Donald L. Brummett

32 **Effects of Soil Strength on the Relation of Water-Use Efficiency and Growth to Carbon Isotope Discrimination in Wheat Seedlings**—Josette Masle* and Graham D. Farquhar

61 **Metabolic Acclimation to Anoxia Induced by Low (2–4 kPa Partial Pressure) Oxygen Pretreatment (Hypoxia) in Root Tips of *Zea mays***—Pierre H. Saglio, Malcolm C. Drew*, and Alain Pradet

85 **Physiological Site of Ethylene Effects on Carbon Dioxide Assimilation in *Glycine max* L. Merr**—George E. Taylor, Jr.* and Carla A. Gunderson

112 **Aluminum Effects on Uptake and Metabolism of Phosphorus by The Cyanobacterium *Anabaena cylindrica***—Annette Pettersson*, Lars Hällbom, and Birgitta Bergman

117 **Internal CO_2 Supply during Photosynthesis of Sun and Shade Grown CAM Plants in Relation to Photoinhibition**—William W. Adams III* and C. Barry Osmond

124 **Oxygen and Temperature Effects on Soybean Seed Coat Respiration Rates**—Thomas R. Sinclair

143 **A Comparison of the Effects of Chilling on Leaf Gas Exchange in Pea (*Pisum sativum* L.) and Cucumber (*Cucumis sativus* L.)**—Thomas C. Peeler* and Aubrey W. Naylor

147 **A Comparison of the Effects of Chilling on Thylakoid Electron Transfer in Pea (*Pisum sativum* L.) and Cucumber (*Cucumis sativus* L.)**—Thomas C. Peeler* and Aubrey W. Naylor

152 **The Influence of Dark Adaptation Temperature on the Reappearance of Variable Fluorescence following Illumination**—Thomas C. Peeler* and Aubrey W. Naylor

200 **Do Stomata Respond to CO_2 Concentrations Other than Intercellular?**—Keith A. Mott

231 **NaCl Induces a Na^+/H^+ Antiport in Tonoplast Vesicles from Barley Roots**—Joan Garbarino* and Frances M. DuPont

246 **Fluorescence Quenching and Gas Exchange in a Water Stressed C_3 Plant, *Digitalis lanata***—Thomas Stuhlfauth, Dieter F. Sültemeyer, Stefanie Weinz, and Heinrich P. Fock*

275 **Effect of Cold Acclimation on Bulk Tissue Electrical Impedance. I. Measurements with Birdsfoot Trefoil at Subfreezing Temperatures**—Darryl G. Stout

283 **Effect of Cold Acclimation on Bulk Tissue Electrical Impedance. II. Measurements with Alfalfa and Birdsfoot Trefoil at Nonfreezing Temperatures**—Darryl G. Stout

288 **Elimination of Differences in the Mobility of Flax Isoperoxidases on PAGE by Digestion with α-Mannosidase**—Pierre-Richard Gaudreault and Hugh Tyson*

329 **Antitranspirant Associated Abscisic Acid Effects on the Water Relations and Yield of Transplanted Bell Peppers**—Gerald A. Berkowitz* and Jack Rabin

355 **Whole Plant CO_2 Exchange Measurements for Nondestructive Estimation of Growth**—Ron G. Dutton, Jirong Jiao, M. James Tsujita, and Bernard Grodzinski*

394 **Temperature-Induced Reversals of Rotation in *Phycomyces***—Matthew P. Wold and R. Igor Gamow*

562 **Ecophysiological Significance of CO_2-Recycling via Crassulacean Acid Metabolism in *Talinum calycinum* Engelm. (Portulacaceae)**—Craig E. Martin*, Michael Higley, and Wei-Zhong Wang

607 **Intracellular Compartmentation of Ions in Salt Adapted Tobacco Cells**—Marla L. Binzel*, F. Dana Hess, Ray A. Bressan, and Paul M. Hasegawa

619 **Studies on the Mode of Action of Acifluorfen-Methyl in Nonchlorophyllous Soybean Cells. Accumulation of Tetrapyrroles**—M. Matringe* and R. Scalla

623 **Limitation of Alternative Respiratory Pathway Activity in Grapefruit Flavedo Tissue by Oxygen Availability**—Albert C. Purvis

734 **Organic Constituents and Complexation of Nickel(II), Iron(III), Cadmium(II), and Plutonium(IV) in Soybean Xylem Exudates**—Dominic A. Cataldo*, Kristin M. McFadden, Thomas R. Garland, and Raymond E. Wildung

740 **Ice-Encasement Injury to Microsomal Membranes Isolated from Winter Wheat Crowns. II. Changes in Membrane Lipids during Ice Encasement**—P. Richard Hetherington, Heather L. Broughton, and Bryan D. McKersie*

744 **Variable Chlorophyll *a* Fluorescence and CO_2 Uptake in Water-Stressed White Spruce Seedlings**—Peter Toivonen and William Vidaver*

754 **Lipid-Sugar Interactions. Relevance to Anhydrous Biology**—Martin Caffrey, Victoria Fonseca, and A. Carl Leopold*

764 **Role of Carbohydrates in Diurnal Chilling Sensitivity of Tomato Seedlings**—Ann I. King*, Daryl C. Joyce, and Michael S. Reid

782 **Gas Exchange Analysis of the Relative Importance of Stomatal and Biochemical Factors in Photosynthetic Induction in *Alocasia macrorrhiza***—Miko U. F. Kirschbaum and Robert W. Pearcy*

863 **Herbicide Resistance in *Datura innoxia*. Cross-Resistance of Sulfonylurea-Resistant Cell Lines to Imidazolinones**—Praveen K. Saxena* and John King

880 **Daytime and Nighttime Carbon Balance and Assimilate Export in Soybean Leaves at Different Photon Flux Densities**—Jeffrey A. Mullen and H. Ronald Koller*

908 **Abscisic Acid Movement into the Apoplastic Solution of Water-Stressed Cotton Leaves. Role of Apoplastic pH**—Wolfram Hartung, John W. Radin, and Donald L. Hendrix*

927 **Ion Fluxes and Abscisic Acid-Induced Proline Accumulation in Barley Leaf Segments**—Pierantonio Pesci

946 **Fluorescence Characteristics of Photoinhibition and Recovery in a Sun and a Shade Species of the Red Algal Genus *Porphyra***—Salil Bose, Stephen K. Herbert*, and David C. Fork

967 **Variation of Transhexadecenoic Acid Content in Two Triazine Resistant Mutants of *Chenopodium album* and Their Susceptible Progenitor**—A. Tremolieres*, H. Darmency, J. Gasquez, M. Dron, and A. Connan

1005 **Alterations in Membrane Protein-Profile during Cold Treatment of Alfalfa**—Shyam S. Mohapatra*, Ronald J. Poole, and Rajinder S. Dhindsa

1032 **Gradients of Intercellular CO_2 Levels Across the Leaf Mesophyll**—David F. Parkhurst*, Suan-Chin Wong, Graham D. Farquhar, and Ian R. Cowan

1108 **Influence of Drought Acclimation and CO_2 Enrichment on Osmotic Adjustment and Chlorophyll *a* Fluorescence of Sunflower during Drought**—Jann P. Conroy*, James M. Virgona, Robert M. Smillie, and Edward W. Barlow

1136 **Early Inhibition of Photosynthesis during Development of Mn Toxicity in Tobacco**—Ross O. Nable, Robert L. Houtz, and George M. Cheniae

1143 **Evidence for Effects on the *in Vivo* Activity of Ribulose-Bisphosphate Carboxylase/Oxygenase during Development of Mn Toxicity in Tobacco**—Robert L. Houtz, Ross O. Nable, and George M. Cheniae*

1179 **Identification and Purification of a Derepressible Alkaline Phosphatase from *Anacystis nidulans* R2**—Maryse A. Block* and Arthur R. Grossman

1240 **Cytoplasmic Distribution of Heat Shock Proteins in Soybean**—Michael A. Mansfield* and Joe L. Key

1276 **Calcium in the Regulation of Gravitropism by Light**—Donna O. Perdue*, Adrienne K. LaFavre, and A. Carl Leopold

1304 **Differential Two-Dimensional Protein Patterns as Related to Tissue Specificity and Water Conditions in *Brassica napus* var *oleifera* Root System**—Catherine Damerval, Nicole Vartanian*, and Dominique de Vienne

1323 **Translational Alterations in Maize Leaves Responding to Pathogen Infection, Paraquat Treatment, or Heat Shock. Polysome Dissociation and Accumulation of a 57 Kilodalton Protein**—Cathy H. Wu, Herman L. Warren, Kalavathy Sitaraman, and Charles Y. Tsai*

DEVELOPMENT AND GROWTH REGULATION

13 **Interference of Phenolic Compounds with the 1-Aminocyclopropane-1-Carboxylic Acid Assay**—Yaron Sitrit, Joseph Riov, and Amos Blumenfeld*

39 **Interrelations between Carbon Dioxide and Ethylene on the Stimulation of Cocklebur Seed Germination**—Yohji Esashi*, Kunimasa Kawabe, Kanji Isuzu-

gawa, and Kimiharu Ishizawa

67 **The Lectins of *Sophora japonica*. II. Purification, Properties, and N-Terminal Amino Acid Sequences of Five Lectins from Bark**—Charles N. Hankins, J. I. Kindinger, and L. M. Shannon*

71 **Effect of Shading Individual Soybean Reproductive Structures on Their Abscisic Acid Content, Metabolism, and Partitioning**—Gary L. Yarrow*, William A. Brun, and Mark L. Brenner

79 **Translocation of Radiolabeled Indole-3-Acetic Acid and Indole-3-Acetyl-*myo*-Inositol from Kernel to Shoot of *Zea mays* L.**—John R. Chisnell and Robert S. Bandurski*

93 **An Investigation of the Mineral Content of Barley Grains and Seedlings**—Ann Stewart, Hilary Nield, and John N. A. Lott*

108 **Photosynthesis and Other Traits in Relation to Chloroplast Number during Soybean Leaf Senescence**—Duane Merlin Ford* and Richard Shibles

216 **Light Affects Flagellar Agglutinability in *Chlamydomonas eugametos* by Modification of the Agglutinin Molecules**—Ron Kooijman*, Piet De Wildt, Wieger L. Homan, Alan Musgrave, and Herman Van den Ende

237 **Gibberellins and Light Regulated Petiole Growth in *Thlaspi arvense* L.**—James D. Metzger

241 **Disruption of the Polar Auxin Transport System in Cotton Seedlings following Treatment with the Defoliant Thidiazuron**—Jeffrey C. Suttle

306 **Growth, *in Vivo* Extensibility, and Tissue Tension in Developing Pea Internodes**—Ulrich Kutschera and Winslow R. Briggs*

332 **Rapid Changes in Protein Phosphorylation Associated with Light-Induced Gravity Perception in Corn Roots**—J. J. McFadden and B. W. Poovaiah*

338 **Polyamine Content of Long-Keeping Alcobaca Tomato Fruit**—Andrew R. G. Dibble, Peter J. Davies*, and Martha A. Mutschler

390 **Polyamine Levels in Petunia Genotypes with Normal and Abnormal Floral Morphologies**—Anton G. M. Gerats, Claudia Kaye, Cynthia Collins, and Russell L. Malmberg*

406 **Water Relations of Seed Development and Germination in Muskmelon (*Cucumis melo* L.). I. Water Relations of Seed and Fruit Development**—Gregory E. Welbaum* and Kent J. Bradford

435 **Phytochrome Regulation of Greening in Barley—Effects on Chlorophyll Accumulation**—Winslow R. Briggs*, Egon Mösinger, and Eberhard Schäfer

451 **Comparison of Starch and ADP-Glucose Pyrophosphorylase Levels in Nonembryogenic Cells and Developing Embryos from Induced Carrot Cultures**—Gregory L. Keller, Basil J. Nikolau, Thomas H. Ulrich, and Eve Syrkin Wurtele*

469 **Evidence Against the Involvement of Ionically Bound Cell Wall Proteins in Pea Epicotyl Growth**—Melissa A. Melan* and Daniel J. Cosgrove

475 **Photoinduced Seed Germination of *Oenothera biennis* L. III. Analysis of the Postinduction Period by Means of Temperature**—Peter A. Ensminger* and Hiroshi Ikuma

522 **Levels of Indole-3-Acetic Acid in *Lemna gibba* G-3 and in a Large *Lemna* Mutant Regenerated from Tissue Culture**—Janet Pernise Slovin* and Jerry D. Cohen

569 ***Datura stramonium* Agglutinin. Location in the Seed and Release upon Imbibition**—Willem F. Broekaert, Diane Lambrechts, Jean-Pierre Verbelen, and Willy J. Peumans*

591 **Dual Effect of Light on the Gibberellin- and Nitrate-Stimulated Seed Germination of *Sisymbrium officinale* and *Arabidopsis thaliana***—Henk W. M. Hilhorst* and Cees M. Karssen

626 **Hydrogen Peroxide Metabolism in Soybean Embryonic Axes at the Onset of Germination**—Susana Puntarulo, Rodolfo A. Sánchez, and Alberto Boveris*

631 **Plasma Membrane Vesicles of Opposite Sidedness from Soybean Hypocotyls by Preparative Free-Flow Electrophoresis**—Hervé Canut, Andrew Brightman, Alain M. Boudet, and D. James Morré*

643 **Kinetics of the Acidification Capacity of Aleurone Layer and Its Effect upon Solubilization of Reserve Substances from Starchy Endosperm of Wheat**—Alberto Hamabata, Mitla García-Maya, Teresa Romero, and Irma Bernal-Lugo*

649 **Selenium as Inducer of Glutathione Peroxidase in Low-CO_2-Grown *Chlamydomonas reinhardtii***—Akiho Yokota*, Shigeru Shigeoka, Toshio Onishi, and Shozaburo Kitaoka

652 **Anthocyanin Production in Chl-Rich and Chl-Poor Seedlings**—Alberto L. Mancinelli*, Ann M. Hoff, and Matthew Cottrell

684 **The Effect of 1,4-Dihydropyridines on the Initiation and Development of Gametophore Buds in the Moss *Funaria***—Patricia A. Conrad and Peter K. Hepler*

725 **Polysomes, Messenger RNA, and Growth in Soybean Stems during Development and Water Deficit**—Hugh S. Mason*, John E. Mullet, and John S. Boyer

749 **Phytochrome Photoconversion *in Vivo*. Comparison between Measured and Predicted Rates**—Alberto L. Mancinelli

822 **A Rapid and Simple Procedure for Purification of Indole-3-Acetic Acid Prior to GC-SIM-MS Analysis**—Kai-Hsien Chen, Anita N. Miller, Glenn W. Patterson, and Jerry D. Cohen*

826 **Effect of Salicylhydroxamic Acid on Endosperm Strength and Embryo Growth of *Lactuca sativa* L. cv Waldmann's Green Seeds**—Carolyn Anne Brooks and Cary Arthur Mitchell*

836 **Role of Ethylene and Cytokinins in the Initiation of Lateral Shoot Growth in Bromeliads**—R. Van Dijck, M. De Proft*, and J. De Greef

873 **Effect of Apoplastic Solutes on Water Potential in Elongating Sugarcane Leaves**—Frederick C. Meinzer* and Paul H. Moore

885 **Comparative Effectivness of Metal Ions in Inducing Curvature of Primary Roots of *Zea mays***—Karl Heinz Hasenstein*, Michael L. Evans, Charles L. Stinemetz, Randy Moore, W. Mark Fondren, E. Colin Koon, Mary A. Higby, and Alvin J. M. Smucker

890 **Effects of Cations on Hormone Transport in Primary Roots of *Zea mays***—Karl Heinz Hasenstein* and Michael L. Evans

904 **Floral Induction in a Photoperiodically Insensitive Duckweed, *Lemna paucicostata* LP6. Role of Glutamate, Aspartate, and Other Amino Acids and Amides**—J. P. Khurana, B. K. Tamot, and S. C. Maheshwari*

951 **Export of Organic Materials from Developing Fruits of Pea and Its Possible Relation to Apical Senescence**—Douglas A. Hamilton and Peter J. Davies*

956 **Mechanism of Export of Organic Material from the Developing Fruits of Pea**—Douglas A. Hamilton and Peter J. Davies*

960 **Inhibition of Stem Elongation in *Cucumis* Seedlings by Blue Light Requires Calcium**—James R. Shinkle and Russell L. Jones*

978 **Photoperiodic and Genetic Control of Carbon Partitioning in Peas and Its Relationship to Apical Senescence**—Maureen O. Kelly* and Peter J. Davies

1070 **Diurnal Growth of Tall Fescue Leaf Blades. I. Spatial Distribution of Growth, Deposition of Water, and Assimilate Import in the Elongation Zone**—Hans Schnyder and Curtis J. Nelson*

1077 **Diurnal Growth of Tall Fescue Leaf Blades. II. Dry Matter Partitioning and Carbohydrate Metabolism in the Elongation Zone and Adjacent Expanded Tissue**—Hans Schnyder, Curtis J. Nelson*, and William G. Spollen

1095 **Cytokinin Fluxes during Floral Induction in the Long Day Plant *Sinapis alba* L.**—Pierre Lejeune*, Jean-Marie Kinet, and Georges Bernier

1150 **Positive Selection for Male-Sterile Mutants of *Arabidopsis* Lacking Adenine Phosphoribosyl Transferase Activity**—Barbara Moffatt and Chris Somerville*

1155 **Do Starch Statoliths Act as the Gravisensors in Cereal Grass Pulvini?**—Il Song, Casey R. Lu, Thomas G. Brock, and Peter B. Kaufman*

1163 **Rapid Wall Relaxation in Elongating Tissues**—Rainer Matyssek, Sachio Maruyama, and John S. Boyer*

1223 **Galactose Inhibition of Auxin-Induced Growth of Mono- and Dicotyledonous Plants**—Ryoichi Yamamoto*, Masahiro Inouhe, and Yosiho Masuda

1236 **Changes in the Level of [^{14}C]Indole-3-Acetic Acid and [^{14}C]Indoleacetylaspartic Acid during Root Formation in Mung Bean Cuttings**—Jeffrey G. Norcini and Charles W. Heuser*

1264 **Auxin-Stimulated NADH Oxidase Purified from Plasma Membrane of Soybean**—Andrew O. Brightman, Rita Barr, Frederick L. Crane, and D. James Morré*

CELLULAR AND STRUCTURAL BIOLOGY

134 **High Resolution Solid State ^{13}C NMR Spectroscopy of Sporopollenins from Different Plant Taxa**—William J. Guilford*, Diane M. Schneider, Jeffrey Labovitz, and Stanley J. Opella

155 **Arabinogalactan-Proteins from Primary and Mature Roots of Radish (*Raphanus sativus* L.)**—Yoichi Tsumuraya*, Kiyoshi Ogura, Yohichi Hashimoto, Harutaka Mukoyama, and Shigeru Yamamoto

270 **Immunogold Localization of the L3 Protein of Maize Lipid Bodies during Germination and Seedling Growth**—Donna E. Fernandez*, Rongda Qu, Anthony H. C. Huang, and L. Andrew Staehelin

412 **Dissociation and Reassembly of Soybean Clathrin**—Ruth E. Wiedenhoeft, Gregory W. Schmidt, and Barry A. Palevitz*

540 **Two Different Families of Hydroxyproline-Rich Glycoproteins in Melon Callus. Biochemical and Immunochemical Studies**—Dominique Mazau*, Dominique Rumeau, and Marie-Thérèse Esquerre-Tugaye

554 **Induced Changes in Chloroplast Protein Accumulation during Heat Bleaching in *Euglena gracilis***—William Ortiz* and Charles J. Wilson

598 **The *Urtica dioica* Agglutinin Is a Complex Mixture of Isolectins**—Els J. M. Van Damme, Willem F. Broekaert, and Willy J. Peumans*

848 **Characterization of Native and Modified Extensin Monomers and Oligomers by Electron Microscopy and Gel Filtration**—J. W. Heckman, Jr., Brian T. Terhune, and Derek T. A. Lamport*

990 **Localization of mRNAs for the Small and Large Subunits of Rubisco Using Electron Microscopic *in Situ* Hybridization**—Judy Brangeon*, J. L. Prioul, and A. Forchioni

993 **Receptor-Mediated Endocytosis in Plants is Energetically Possible**—Michael J. Saxton* and R. William Breidenbach

1027 **Bark and Leaf Lectins of *Sophora japonica* Are Sequestered in Protein-Storage Vacuoles**—Eliot M. Herman*, Charles N. Hankins, and Leland M. Shannon

1057 ***In Vitro* Synthesis and Processing of Tomato Fruit Polygalacturonase**—Dean DellaPenna and Alan B. Bennett*

1120 **Light-Harvesting Chlorophyll *a/b* Protein. Membrane Insertion, Proteolytic Processing, Assembly into LHC II, and Localization to Appressed Membranes Occurs in Chloroplast Lysates**—Kenneth Cline

1270 **Changes in the ^{14}C-Labeled Cell Wall Components with Chase Time after Incorporation of UDP[^{14}C]Glucose by Intact Cotton Fibers**—W. M. Dugger* and Raymond L. Palmer

MICROBE-PLANT INTERACTIONS

182 **Chitinase cDNA Cloning and mRNA Induction by Fungal Elicitor, Wounding, and Infection**—Susan A. Hedrick, John N. Bell, Thomas Boller, and Christopher J. Lamb*

491 **Carbon Cost of the Fungal Symbiont Relative to Net Leaf P Accumulation in a Split-Root VA Mycorrhizal Symbiosis**—David D. Douds*, Charles R. Johnson, and Karen E. Koch

547 **Lipid Peroxidation Is a Consequence of Elicitor Activity**—Kim R. Rogers, Fred Albert, and Anne J. Anderson*

581 **Time Course of Acetylene Reduction in Nodules of Five Actinorhizal Genera**—John D. Tjepkema*, Christa R. Schwintzer, and Christopher A. Monz

638 **Characterization of Root Hair Cell Walls as Potential Barriers to the Infection of Plants by Rhizobia. The Carbohydrate Component**—Andrew J. Mort* and Paul B. Grover, Jr.

693 **Uniformity of the Microsymbiont Population from Soybean Nodules with Respect to Buoyant Density**—Dale B. Karr and David W. Emerich*

1210 **Efficiency of Nodule Initiation in Cowpea and Soybean**—T. V. Bhuvaneswari, Andrew P. Lesniak, and Wolfgang D. Bauer*

1228 **Role of Motility and Chemotaxis in Efficiency of Nodulation by *Rhizobium meliloti***—Gustavo Caetano-Anollés*, Luis G. Wall, Ana T. De Micheli, Edgardo M. Macchi, Wolfgang D. Bauer, and Gabriel Favelukes

1292 **The *Glycine-Glomus-Rhizobium* Symbiosis. VII. Photosynthetic Nutrient-Use Efficiency in Nodulated, Mycorrhizal Soybeans**—Milford S. Brown and Gabor J. Bethlenfalvay*

1298 **Root Exudates of Various Host Plants of *Rhizobium leguminosarum* Contain Different Sets of Inducers of *Rhizobium* Nodulation Genes**—Sebastian A. J. Zaat*, Carel A. Wijffelman, Ine H. M. Mulders, Anton A. N. van Brussel, and Ben J. J. Lugtenberg

MEMBRANES AND BIOENERGETICS

1 **Structure, Function, and Evolution of Proton-ATPases**—Nathan Nelson

76 **Separation of Chlorophylls c_1 and c_2 from Pigment Extracts of *Pavlova gyrans* by Reversed-Phase High Performance Liquid Chromatography**—Marvin W. Fawley

335 **Lipid Saturation Induced Microviscosity Increase Has No Effect on the Reducibility of Flash-Oxidized Cytochrome *f* in Pea Thylakoids**—Zoltán Gombos, Klára Barabás, Ferenc Joó, and László Vigh*

341 **The Dependence of Stomatal Closure on Protein Synthesis**—Kenneth V. Thimann* and Zhi-Yi Tan

352 **Effects of Temperature on H^+ Uptake and Release Dur-**

ing Circadian Rhythmic Movements of Excised *Samanea* Motor Organs—Youngsook Lee* and Ruth L. Satter

429 **Absence of Variable Fluorescence from Guard Cell Chloroplasts of *Stenotaphrum secundatum*—**Quanning Li and Eugene A. Nothnagel*

505 **Rapid Changes in Plasma Membrane Protein Phosphorylation during Initiation of Cell Wall Digestion—**David P. Blowers, Wendy F. Boss*, and Anthony J. Trewavas

512 **Isolation and Sequence of Tryptic Peptides from the Proton-Pumping ATPase of the Oat Plasma Membrane—**G. Eric Schaller* and Michael R. Sussman

575 **Evidence for the Presence of a Sucrose Carrier in Immature Sugar Beet Tap Roots—**Remi Lemoine, Jaleh Daie*, and Roger Wyse

655 **Chlorophyll *a* Fluorescence Yield as a Monitor of Both Active CO_2 and HCO_3^- Transport by the Cyanobacterium *Synechococcus* UTEX 625—**Anthony G. Miller*, George S. Espie, and David T. Canvin

672 **The Generation of Singlet Oxygen ($^1O_2$) by the Nitrodiphenyl Ether Herbicide Oxyfluorfen Is Independent of Photosynthesis—**Phil Haworth* and F. Dan Hess

677 **Active Transport of CO_2 by the Cyanobacterium *Synechococcus* UTEX 625. Measurement by Mass Spectrometry—**Anthony G. Miller*, George S. Espie, and David T. Canvin

717 **Separation and Immunological Characterization of Membrane Fractions from Barley Roots—**Frances M. DuPont*, Charlene K. Tanaka, and William J. Hurkman

759 **Nitrate Absorption by Corn Roots. Inhibition by Phenylglyoxal—**Kanwarpal S. Dhugga, J. Giles Waines, and Robert T. Leonard*

769 **Light-Induced Proton Release by the Cyanobacterium *Anabaena variabilis*. Dependence on CO_2 and Na^+—**Siegfried Scherer, Heike Riege, and Peter Böger*

778 **Exogenous $^{15}NO_3^-$ Influx and Endogenous $^{13}NO_3^-$ Efflux by Two Maize (*Zea mays* L.) Inbreds during Nitrogen Deprivation—**Robert H. Teyker*, William A. Jackson, Richard J. Volk, and Robert H. Moll

803 **Phloem Mobility of Xenobiotics. I. Mathematical Model Unifying the Weak Acid and Intermediate Permeability Theories—**Daniel A. Kleier

811 **Phloem Mobility of Xenobiotics. II. Bioassay Testing of the Unified Mathematical Model—**Francis C. Hsu*, Daniel A. Kleier, and Wayne R. Melander

817 **The Kinetics of Chlorate Uptake by XD Tobacco Cells—**Micha Guy*, Gracia Zabala, and Phillip Filner

830 **Induced K^+ Efflux from Cultured Rose Cells. Effects of Protein-Synthesis Inhibitors—**Terence M. Murphy

841 **Cytochemical Localization of ATPase Activity in Oat Roots Localizes a Plasma Membrane-Associated Soluble Phosphatase, Not the Proton Pump—**Donald B. Katz*, Michael R. Sussman, Robert J. Mierzwa, and Ray F. Evert

899 **Early Activation by Ethylene of the Tonoplast H^+-Pumping ATPase in the Latex from *Hevea brasiliensis*—**Xavier Gidrol*, Hervé Chrestin, Gilles Mounoury, and Jean D'Auzac

914 **Influence of Nitrate and Ammonium Nutrition on the Uptake, Assimilation, and Distribution of Nutrients in *Ricinus communis*—**Marinus L. Van Beusichem*, Ernest A. Kirkby, and Robert Baas

996 **N-Terminus Conservation in the Terminal Pigment of Phycobilisomes from a Prokaryotic and Eukaryotic Alga—**Elisabeth Gantt*, Francis X. Cunningham, Jr., Claudia A. Lipschultz, and Mamoru Mimuro

999 **Measurement of Proton-Linked Transport Activities in Pyranine Loaded Chloroplast Inner Envelope Vesicles—**Konrad T. Howitz and Richard E. McCarty*

1038 **Hormone Action on Transmembrane Electron and H^+ Transport—**Michael Böttger* and Frank Hilgendorf

1044 **Hexachloroiridate IV as an Electron Acceptor for a Plasmalemma Redox System in Maize Roots—**Hartwig Lüthen and Michael Böttger*

1168 **Characterization of the H^+ Translocating Adenosine Triphosphatase and Pyrophosphatase of Vacuolar Membranes Isolated by Means of a Perfusion Technique from *Chara corallina*—**Kazuhiko Takeshige*, Masashi Tazawa, and Achim Hager

1257 **Quantitative and Rapid Estimation of H^+ Fluxes in Membrane Vesicles. Software for Analysis of Fluorescence Quenching and Relaxation—**Ian R. Jennings, Philip A. Rea, Roger A. Leigh, and Dale Sanders*

1315 **Dissipation of pH Gradients in Tonoplast Vesicles and Liposomes by Mixtures of Acridine Orange and Anions. Implications for the Use of Acridine Orange as a pH Probe—**Andrew J. Pope* and Roger A. Leigh

NATURAL PRODUCTS

187 **Isolation and Biological Activities of Four Selective Toxins from *Helminthosporium carbonum*—**Jack B. Rasmussen and Robert P. Scheffer*

399 **Purification and Characterization of Arcelin Seed Protein from Common Bean—**Thomas C. Osborn*, Mark Burow, and Fredrick A. Bliss

857 **Endogenous Gibberellins from Sporophytes of Two Tree Ferns, *Cibotium glaucum* and *Dicksonia antarctica*—**Hisakazu Yamane, Shozo Fujioka, Clive R. Spray, Bernard O. Phinney*, Jake MacMillan, Paul Gaskin, and Nobutaka Takahashi